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Soils and Crops Branch

Crop Protection Section

Chemical Weed Control in Cereal, Oilseed, Pulse and Forage Crops 1987

Contents

Foreword 2
Container Disposal 4
Incorporation of Soil-Applied Herbicides 5
Leaf Stages of Cereals 6
Pesticide Safety 7
The Metric System 8
Plant Growth Regulators 74
Herbicide Tank Mix Chart 75
Forage Recommendation Chart 76
Weed Control in Forages 77
Fall Weed Control 81
Zero-Tillage 82
Chemical Fallow 83
Perennial Weed Control 84
Volunteer Crop Control 85
Herbicide and Liquid Fertilizer Mixes 85
Herbicide and Insecticide Mixes 85
Soil Residual Herbicides 86
Aircraft Application 88
Crop Dessication 89
Special Weed Problems 90
Cleaning the Sprayer 93
Effect of Rainfall 93
Grazing Restrictions 94
Winter Storage of Herbicides 96
Chemical Products and Availability 97
Additional Information 99
Major Poison Control Centres 99
Herbicide Recommendation Chart ..... Insert

Herbicide Information

Afolan F 11
Asulox F 12
Avadex BW 13
Avenge 200-C, Avenge 640 16
Banvel LH, Banvel Herbicide 18
Bar-Fox DS 60
Basagran 20
Basfapon 21
Benazolin 22
Bladex TTC 23
Blagal 24
Bromox 720 M 53
Buctril-M 25
Cobutox 27
Dowpon M 21
Dyvel 26
Embutox 625 27
Eptam 8-E 28
Estaprop 29
Fortress 30
Glean 32
Heritage 34
Hoe-Grass 36
Hoe-Grass II 38
Kerb 50W 39
Kilmor 40
Lexone DF 41
Lontrel 42
Lorox L 43
MCPA 71
Mataven, Mataven L 44
Mecoturf 45
NaTA 60
Pardner 46
Poast 47
Princep Nine-T 49
Rival 50
Sabre 53
Sencor 75 DF, Sencor 500 54
Simazine 80W 49
Sinbar 56
Stampede 360 57
Stampede CM 59
TCA 60
Target 61
Torch DS 62
Tordon 202-C 64
Treflan 65
Triflurex 68
Tropotox Plus 70
2,4-D Butyric 400 27
2,4-D 71

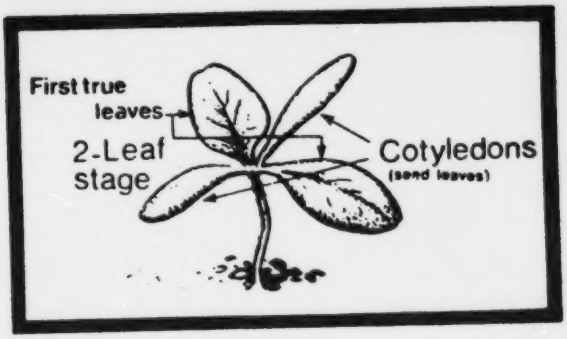
This publication is intended to be used as a guide only. The information presented here should be applicable to most situations if recommendations are followed carefully. Brand names used are included for convenience. Their use does not imply endorsement by the authors or the department.

While every effort has been made to ensure accuracy, Saskatchewan Agriculture does not accept any responsibility for errors in conversion or otherwise. **Consult product labels for final detailed instructions before using product.**

Note: This publication is updated annually and replaces the 1986 and previous issues.

Foreword

Chemical weed control should be regarded as only one part of an overall weed control program on the farm and should not be relied on as the only method of protecting crops from weeds. Thus, herbicide treatments should be used only where they are required to supplement good cultural and mechanical weed control practices. The best weed control method is a strong vigorous, competitive crop. For sources of additional information, see page 99.



How to use this book:
Begin by referring to the fold out chart in the centre of the book. Use the chart to determine the herbicides that can be used for your crop-weed combination. Then refer to the appropriate product reference pages for information on use of the products that can be used in your situation. Use these pages to help select the most appropriate herbicide.

All rate recommendations in this publication are in terms of the actual amount of the product to be used.

Factors that affect herbicide performance

The effectiveness of any given herbicide is affected by a large number of factors.

Thus, results often vary from year to year and from location to location. Knowledge of these factors and how they affect the performance of different products will help to avoid situations that may result in reduced control.

1. **Use the Right Herbicide** — The choice of herbicide depends on the type of weeds in the crop and the tolerance of the crop to various herbicides.

2. **Spray Early** — Weeds are easier to kill when young. Early weed eradication removes competition, saves moisture and increases yields. Crop stage must be considered.

3. **Apply the Correct Rate** — Using a properly calibrated sprayer. Do not reduce recommended rates.

4. **Growing/Soil Conditions** — The following factors can all influence herbicide performance.

   (a) Growing conditions - In general weeds are easiest to kill when they are small and growing rapidly. Translocated herbicides (eg. 2,4-D, Banvel) work best when weeds are actively growing. Contact type herbicides (eg. Torch, Pardner) usually do not lose as much activity when growing conditions are less favourable. Crops are generally more subject to damage when they are under stress.

   (b) Temperature/Humidity - High temperatures and low relative humidity result in rapid drying of droplets and herbicide loss due to evaporation. Crop injury may be increased with some products when temperature and humidity are both very high. Better weed control usually results when herbicides are applied during the cooler parts of the day.

   (c) Soil Moisture, Organic Matter, Texture - Soil incorporated herbicides are affected by these three factors. Weed control is best when soil moisture conditions are good. Excessive drying of the soil during incorporation procedures will reduce their effectiveness. Granular formulations generally require more soil moisture than liquid formulations for similar results. Soils high in organic matter and/or clay will require higher rates of herbicide to obtain adequate control.

   (d) Rainfall - All products require a rain-free period after application to allow time for the weeds to absorb the chemical. Depending on the product, this period can range from 15 minutes to six hours or more.

   (e) Water Quality/Temperature - Extremely hard water or water containing large amounts of silt will inactivate some products resulting in nozzle plugging and reduced weed control.

   (f) Crop Competition - Many products depend on vigorous crop competition to assist in obtaining good weed control. Use of such products in unthrifty crops is not likely to be economical.

5. **Water Volume** — Good penetration of the crop canopy and good coverage of the weeds is essential for good weed control. Unless otherwise stated on the label, products should

be applied in at least 100 L of water/ha (40 L/ac).

Proper Use of Herbicides — It is an offence under the Pest Control Products Act of Canada and Saskatchewan to use a herbicide in a manner other than as stated on the label. The user of these products has the responsibility to take every precaution to avoid harmful side effects from the use of herbicides. Great care should be taken to avoid the contamination of water sources when filling sprayers.

Always Read the Label and Observe All Precautions

Reduce Spray Drift — Use Amine or Low Volatile (L.V.) formulations of 2,4- D. No safe distances can be given.

— **Use Lots of Water** — Use of 90-110 L/ha (35-45 L/ac) will result in fewer small, "driftable" droplets.
— **Use Low Pressures** — 240-300 kPa (35-44 psi) is the recommended operating range for flat fan nozzles. Consult recommendations or product labels for specific requirements for various products.
— **Use 80 or 110 degree nozzles** — 80 degree nozzles can be run approximately 10 cm (4 in.) closer to the target weeds than can the traditional 65 degree nozzles. 110 degree nozzles can be run 10-20 cm (4-8 in.) closer than 65 degree nozzles. This lowering of boom height reduces exposure of the spray droplets to the wind and results in reduced droplet drift. 80 degree nozzles (designated as 80 degree LP nozzles) designed to operate at pressures as low as 100 kPa (15 psi) are being introduced and should further reduce drift hazards. Do not use flood jet or hollow cone nozzles unless specified on the herbicide label.
— **Do Not Spray** when winds are blowing toward sensitive plants or when wind velocity is high enough to cause significant drift.

Chemical Injection Systems

Chemical injection systems on sprayers are designed to avoid tank mixing of herbicides or other pesticides. One or more chemical tanks or containers may be provided. The second chemical may be applied continuously or there may be a provision to apply it, as desired for spot treatment of patches or smaller areas of certain weeds. The use of chemical injection systems permits the retrieval of left-over chemicals and spot treatment with a second chemical, both of which can provide substantial saving in chemical cost.

Precautions are necessary to obtain good results and to avoid possible problems when mixing chemicals. The following should be considered when spraying with chemical injection systems.

1. The flow or application rate of each chemical must be calibrated. Since flow rates are often quite low, the settings may have to be precise depending on the metering system that is provided.
2. Only chemicals approved for tank-mixing can be applied. Chemical application without tank-mixing is expected to give the same results as tank-mixing, although field results are not available. Chemical injection systems that provide mixing of each chemical separately with water are preferred, rather than mixing the chemicals together before mixing with the water in the line. Mixing of undiluted chemicals may cause objectionable or hazardous results.
3. Certain chemicals that are designated as WP (wettable powder), WDG (water dispersible granule), DF (dry flowable) are not suitable for use in chemical injection systems. WSP (water soluble powder) could be used, but the user would have to dissolve the powder, work out the application rate of the solution and apply accordingly. Some WSP chemicals may not dissolve completely in small volumes of water and could cause significant problems.
4. Thorough cleaning of chemical tanks and lines are required when changing from one chemical to another. Small residues can cause severe injury to some crops.
5. The time required for a chemical to reach all sprayer nozzles, after it is switched on, may be more than 1 or 2 minutes depending on the sprayer system design. Large or wide sprayers retrofitted with injection systems without altering the boom pipe or plumbing will have longer delay times. This is important for spot treatment since the travel distance in 1 or 2 minutes can be several hundred metres depending on travel speed.
6. Gain a thorough understanding of the operating characteristics of the chemical injection system before using to ensure satisfactory results.
7. When handling undiluted chemicals take precautionary measures to minimize exposure. Adopt protective measures by using proper protective equipment and good personal hygiene.

Wetting Agents

Most herbicides contain sufficient wetting agent in the formulated product. Addition of extra wetting agent is not recommended unless the product label so recommends. Use only wetting agents that are registered for use and carry a Pest Control Products registration number on the label.

Herbicide Container Disposal

Problems and Potential Dangers of Indiscriminate Disposal of Waste Containers:

(i) Potential contamination of ground and/or surface waters if used containers are left lying near wells, streams, dugouts or in areas with high water tables.
(ii) Many residues left in containers are toxic to fish and other forms of wildlife.
(iii) Potential access by members of the public to dangerous chemicals is cause for concern. This is especially so with children playing with the used containers.

Procedure for Disposal

Saskatchewan Environment has initiated a voluntary program for the collection and crushing of metal pesticide containers discarded by farmers and the disposal of associated residues.

Thoroughly rinsed containers may be delivered to collection sites selected by participating rural municipalities. Once delivered to the collection site, the containers must be deposited only within the fenced-in area specified and stacked on their sides to prevent rain water from entering and pesticide residues from escaping the containers. If a collection site has not been designated within a rural municipality, the current best method for agricultural container disposal is to rinse, crush and bury the containers on the user's own farm.

Rinse:

Rinse containers well and add the rinse water to the sprayer tank to reduce the chemical residue left in the container to a minimum. Whether triple or pressure rinsing containers, the contents of the container are first emptied into the spray tank and the container drained while held in a vertical position for at least 30 seconds. In the triple rinse procedure, a measured amount of rinse water or other dilutent is added to the container so that it is about one fifth full. The container is closed, shaken thoroughly and the rinsate drained into the spray tank. The rinse procedure is then repeated two more times. Pressure rinsers have the versatility to rinse all containers which can be lifted into position over the spray tank opening. These devices are constructed to be thrust through the bottom of a plastic or metal container and residual pesticide rinsed into the spray tank using a pressurized water source. The pressure rinsers have the added advantage of rendering the containers useless for other uses by automatically puncturing them. All rinsing procedures should take place away from wells and surface waters.

Crush:

All containers should be crushed as best as is practical to render them useless for any other task and to assist in the burial process.

Bury:

The burial site should be an uncropped area away from wells, ponds, streams, or livestock feeding areas. There should be little or no runoff and the water table in the area should be at least three (3) metres below the soil surface. A clay or loam soil is most suitable for the burial site. The area of disposal should be marked or recorded.

Bury containers at least thirty (30) cm below the surface. Compact the backfill to retard seepage.

Incorporation of Soil-Applied Herbicides

The recommended procedures for mixing or incorporating pre-emergent herbicides into the soil are given by the manufacturer of the herbicide. Long term studies have shown that such procedures will usually give the desired result. Exceptions occur though, due to the wide variety of soil and climatic conditions. Appropriate changes in the incorporation procedures can be of benefit under certain conditions. Some of the principles involved in the incorporation of herbicides are discussed below.

Herbicide: Different herbicides may require a different depth of incorporation for maximum effectiveness. The depth may vary depending on the prevalent weed to be controlled and the crop to be grown. For example, Treflan should be mixed relatively deeply for control of wild oats whereas a shallow depth is better for control of green foxtail. Be sure to read the label requirement. Coarse textured (sandy) soils and those soils with low organic matter may require different rates of herbicides than other soils.

Soil Condition: Loose, mellow soils are ideal for mixing the herbicide uniformly to the desired depth. Hard and lumpy soils, and those which are wet and sticky make it difficult to get uniform and proper mixing. Different incorporation procedures are likely required for such soils. Dry soil will, in many cases, limit herbicide activity. An incorporation procedure that dries out the soil just before seeding or even after seeding can result in poor weed control and poor emergence of the crop. Timing and the method of the incorporation is important where weather conditions will dry out the soil very quickly. Referring again to hard lumpy soils; the type of herbicide used, that is liquid or granular, can determine the procedure to use for incorporation. Granules placed on hard lumpy soil before incorporation can fall between the lumps and go too deeply, whereas liquid is attached to the soil. Therefore, if granules are to be used, it may be necessary to prework the soil to get it into a condition where the granules will be mixed within the desired soil layer. Careful assessment of the condition is required. Such lumpy or sticky soils may require several operations to get them into a good condition for proper incorporation. Many operations though, can also further dry out the soil making it unsuitable for the crop to be planted.

The other extreme is the very loose soft soil where the recommended procedure for incorporation may leave the soil so fine that it will be subject to both wind and water erosion. Although this condition may be ideal for incorporation, the loss of eroded soil is costly. In this case soil incorporation should be avoided if alternate methods of weed control are available.

Equipment for Incorporation: All kinds of tillage equipment can be used to incorporate herbicides, but the choice depends on the herbicide to be used, its preferred location in the soil, the condition of the soil and the availability of such implements. The depth and speed of operation are also important. The incorporating action of various implements are discussed below.

Tandem disc harrows, discers and any kind of disc type implement will provide deeper incorporation, more soil breakdown, faster and more uniform mixing to the depth of tillage than most other implements. These should be used where deep incorporation is needed, where the soil is lumpy or sticky and where soil erosion is not considered to be a problem.

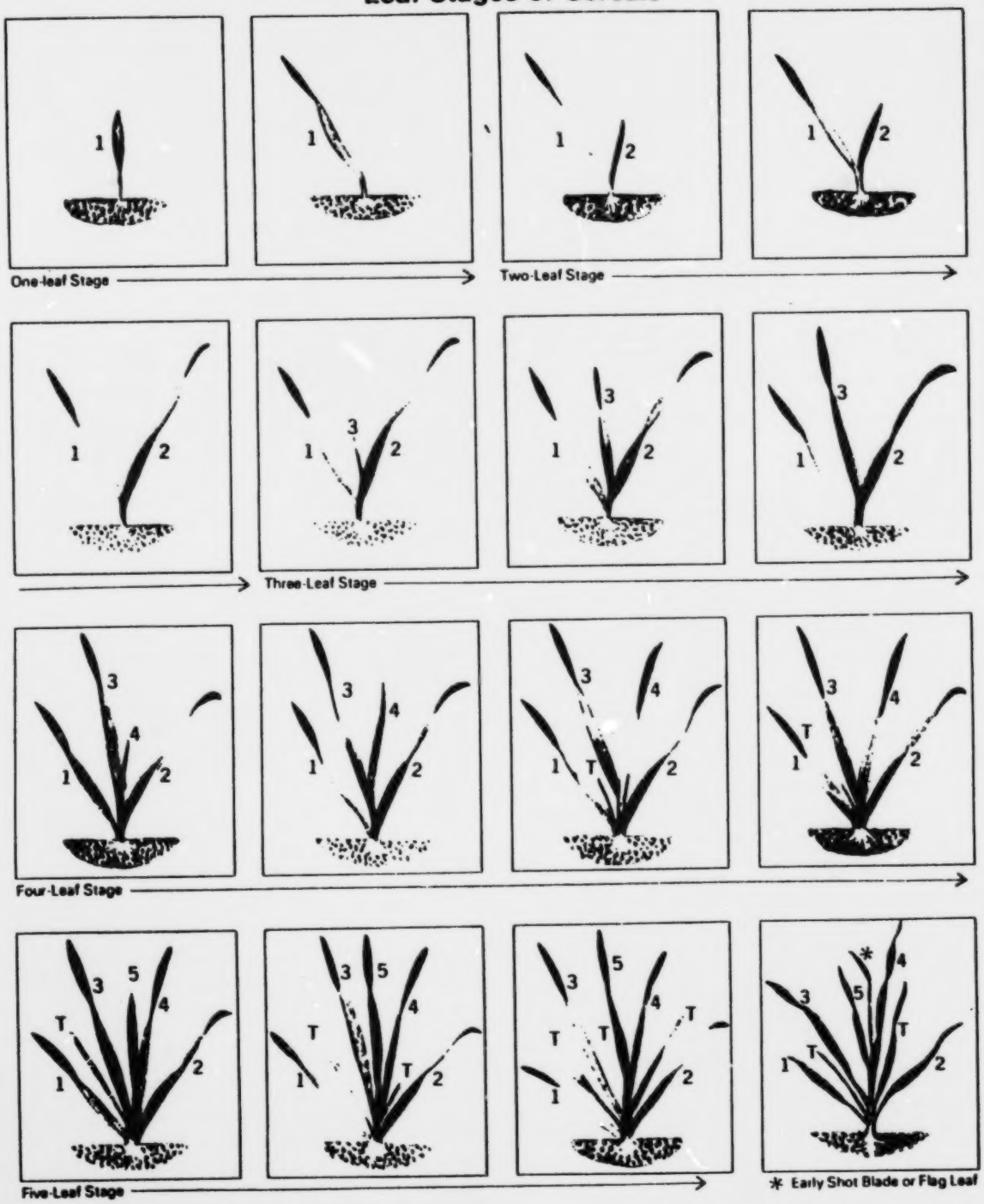
Cultivators of all kinds can be used but tend to give shallower incorporation. Deep tillage (10 cm (4 in.) or more) will give less soil disturbance than a shallower operation. For good mixing a high travel speed is necessary; a speed high enough to throw soil upward and sideways will give more even incorporation. Higher speeds also help to break up lumps, but in loose soils will contribute to possibilities of erosion. Any kind of cultivator can be used (even hoe-drills will work), but shank spacing, speed, depth and kind of sweeps affect how well the incorporation is done. Harrows are very useful for shallow incorporation but the soil needs to be loose if they are used; otherwise incorporation will be very shallow. Tine harrows behind cultivators contribute to better mixing due to the lively action of the tines. Drag harrows on stubble fields may not work very well for incorporation if they are constantly loaded with a lot of trash. Rotary or oscillating harrows are quite effective in trashy field conditions.

Rod weeders and wide blade machines are not capable of mixing herbicides in the soil and cannot be recommended for that purpose.

In stubble the most effective incorporation of liquid is obtained if the field is first worked until about two thirds of the surface is black. Bunches of straw and chaff left on the field will absorb the liquid and therefore good straw spreading at harvest time is important. Granules can be applied directly to stubble before tillage but as with the liquid herbicides the bunches of straw should be spread. The spray boom or granular attachment behind discers is also a very effective method for simultaneous application and incorporation when seeding stubble crops, as well as on summerfallow. Weed or volunteer crop growth on fields will also absorb liquid herbicide.

In summary it can be said that precaution and a careful assessment of the field, climatic conditions and herbicide requirement is needed before deciding on the incorporation procedure. If conditions are extreme, either more or less incorporation action will be needed. Do not overwork if not needed, but do enough to ensure the proper mixing and to get the herbicide in the right location.

Leaf Stages of Cereals



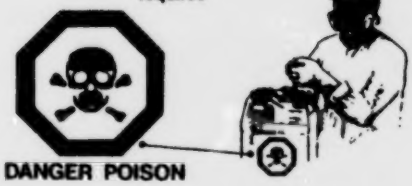
NOTE: The above drawings are a guide in following recommendations for herbicide application to wheat, oats, barley and rye. As an example, the two-leaf stage extends from the time the second leaf begins to emerge and continues until the third leaf begins to emerge. Tillers (T) are not counted as leaves.

Using Pesticides?

protect yourself!

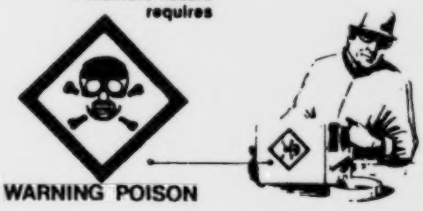
goggles
respirator
gloves and
skin protection
avoid fumes
and spray mist

high hazard requires



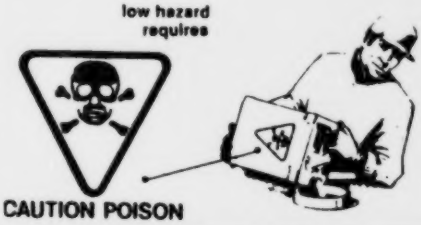
moderate hazard requires

goggles
gloves and
skin protection
avoid fumes
and spray mist



low hazard requires

gloves and
skin protection
avoid fumes
and spray mist



Standard Pesticide Safety Precautions

For each level of hazard illustrated above, certain safety precautions to minimize exposure are required. The level of hazard is indicated on the pesticide label, unless the pesticide is considered non-toxic. In this case, no symbol will appear on the label.

To minimize exposure, pesticide applicators should adopt adequate protective measures by using proper protective equipment and good personal hygiene. Safety equipment is available in Saskatchewan from safety equipment suppliers, farm supply stores and some elevators.

1. Coveralls: Long sleeved coveralls over clean work clothing will provide increased protection against dermal exposure resulting from drift, splashing or spills. Reusable cotton coveralls are washable and can be used repeatedly. Disposable coveralls and reusable unlined rubber coveralls are also available. If coveralls become damaged or severely contaminated, they should be discarded. All cotton clothing and cotton coveralls should be washed daily (separate from all other wash) in hot water and detergent, rinsed and dried.
2. Footwear: Wear knee length rubber or neoprene unlined boots. The legs from the coveralls should be outside the top of the boots. Since both leather and canvas readily absorb pesticides, contaminated footwear made of these materials will continually expose the feet to pesticides.
3. Head gear: A waterproof wide brimmed hat or hard hat equipped with a plastic sweat band is recommended. Cloth type hats should not be worn, as they readily absorb pesticides. Washing will not remove pesticides from these caps, therefore the scalp and forehead would be continually exposed.
4. Gloves: Unlined rubber or neoprene gloves are recommended. Do not wear leather or cloth gloves, as they readily absorb pesticides. Sleeves of coveralls should be worn over the gloves.
5. Goggles: Should be worn during mixing and tank filling, container rinsing or during sprayer maintenance to prevent accidental exposure to the eyes. The straps on the goggles should be of plastic or rubber so the goggles can be washed daily with soap and water. Gas permeable and soft contact lenses should not be worn.
6. Respirators: The use of respirators and cartridges approved for use with pesticides is recommended for high hazard pesticides. A good rule of thumb to follow is use of a respirator to minimize inhalation exposure when handling all pesticides. The cartridges should be changed when odours are detected through them, when breathing is restricted, or according to manufacturer's instructions. When not in use, the respirator and cartridges should be stored in a sealed plastic bag to prevent contamination and deactivation.

The Metric System

This publication presents information regarding spray volumes and application rates in a dual system. Where applicable, recommendations are made first in metric measure per hectare, followed by (metric measure per acre) in brackets. **Herbicide labels will remain entirely in metric as required by the Pest Control Products Act of Canada.**

The majority of herbicides used in Saskatchewan are recommended to be applied in 100 litres of spray solution per hectare (40 litres per acre), at a spray pressure of 275 kilopascals (40 psi) and at a ground speed of 9 kilometres per hour (5.6 mph). These are standard application recommendations.

TABLE 1 Spray Volume
The Standard Application Volume is:
100 litres per hectare (L/ha) = 40 litres per acre (L/ac)
1 ha = 2.47 acres

Approximate Conversions

Litres per Hectare L/ha	Litres per Acre L/ac	Gallons per Acre gal/ac
45	18	4.0
50	20	4.5
60	25	5.3
100	40	8.9
110	45	9.8
150	60	13.4
165	65	14.7
200	80	17.8
220	90	19.6
300	120	26.7

TABLE 2 Spray Pressure
The Standard Spraying Pressure is:
275 kilopascals (kPa) = 40 pounds per square inch (psi)
6.9 kPa = 1 psi

Approximate Conversions

Kilopascals kPa	Pounds per sq. inch psi
100	15
150	22
175	25
200	30
250	35
275	40
300	44
350	50
425	60

TABLE 3 Ground Speed
The Standard Ground Speed for Spraying is:
9 kilometres per hour (km/h) = 5.6 miles per hour (mph) 1.6 km/h = 1 mph

Approximate Conversions

Kilometres per hour km/h	Miles per hour mph
6	3.8
7	4.3
8	5.0
9	5.6
10	6.2
11	6.8
12	7.5
15	9.3

Note: The maximum speed recommended for incorporation of soil applied herbicides is 8 km/h (5 mph).

TABLE 4 Application Volumes of Flat Spray Tips For the majority of herbicides used in Saskatchewan the Standard Nozzle Tips recommended are Delavan LF2-80 and Tee Jet 8002. At 9 km/h (5.6 mph) these nozzle tips will apply 100 litres of spray volume per hectare (40 litres per acre).

Nozzle Tip		Pressure	Capacity	Litres per hectare (Litres per acre)				
Delavan	TeeJet	(kPa)	(mL/min)	6 km/h	8 km/h	9 km/h	10 km/h	12 km/h
LF067-80º	800067	275	250	50	38	33	30	25
LF067-65º or 80º	650067 & 800067			(20)	(15)	(13)	(12)	(10)
LF1-80º	8001 & 11001	275	378	76	57	50	45	38
LF1-65º or 80º	6501,8001 & 11001			(31)	(23)	(20)	(18)	(15)
LF1.5-80º	80015 & 110015	275	566	113	85	76	68	57
LF1.5-65º or 80º	65015,80015 & 110015			(46)	(34)	(31)	(28)	(23)
LF2-80º	8002 & 11002	275	756	151	113	100	9	76
LF2-65º or 80º	6502,8002 & 11002			(61)	(46)	(40)	(36)	(31)
LF3-80º	8003 & 11003	275	1132	230	170	151	136	113
LF3-65º or 80º	6503,8003 & 11003			(93)	(69)	(61)	(55)	(46)
LF4-80º	8004 & 11004	275	1512	305	230	202	181	151
LF4-65º or 80º	6504,8004 & 11004			(123)	(93)	(82)	(73)	(61)

NOTE: Nozzles spaced at 50 centimeters (20 inches)

For additional information regarding herbicide application and sprayer operation refer to A Guide to Field Sprayer Operation. This publication is available from Agricultural Representatives and the Agricultural Engineering Section, Extension Services Branch, Saskatchewan Ariculture, Regina, Saskatchewan.

TABLE 5 Area
1 hectare = 2.47 acres

Approximate Conversions

Acres ac	Hectares ha
1	0.4
2.5	1
5	2
10	4
15	6
20	8
25	10
30	12
40	16
50	20
60	24
70	30
160	64

TABLE 6 Spray Tank
1 gallon = 4.55 litres

Approximate Conversions

Gallons	Litres
100	450
110	500
150	700
200	900
220	1000
250	1100
300	1400
330	2500
350	1600
400	1800
440	2000
500	2300
800	3600

TABLE 7: Approximate Conversion Factors*

Metric to Imperial			Imperial to Metric	
Metric Unit	**Multiply By**	**Imperial Unit**	**Multiply By**	**Metric Unit**
LINEAR				LINEAR
centimetre (cm)	x 0.39	inch	x 2.54	centimetre (cm)
AREA				AREA
square metre (m^2)	x 1.2	square yard	x 0.84	square metre (m^2)
hectare (ha)	x 2.5	acres	x 0.4	hectare (ha)
VOLUME				VOLUME
litre (L)	x 0.22	gallon	x 4.55	litre
PRESSURE				PRESSURE
kilopascals (kPa)	x 0.14	psi	x 6.9	kilopascals (kPa)
WEIGHT				WEIGHT
gram (g)	x 0.04	oz avdp	x 28.35	gram (g)
kilogram (kg)	x 2.2	lb avdp	x 0.454	kilogram (kg)
AGRICULTURAL				AGRICULTURAL
litres per hectare (L/ha)	x 0.089	gallons/acre	x 11.23	litres per hectare (L/ha)
litres per hectare (L/ha)	x 0.357	quarts/acre	x 2.81	litres per hectare (L/ha)
litres per hectare (L/ha)	x 0.71	pints per acre	x 1.41	litres per hectare (L/ha)
millilitres per hectare (mL/ha)	x 0.014	fl. oz per acre	x 70.22	millilitres per hectare (mL/ha)
kilograms per hectare (kg/ha)	x 0.89	lb per acre	x 1.12	kilograms per hectare (kg/ha)
grams per hectare (g/ha)	x 0.014	oz avdp/acre	x 70	grams per hectare (g/ha)

*EXAMPLE: To convert centimetres to inches, multiply by 0.39; conversely, to convert inches to centimetres, multiply by 2.54.
CAUTION: Herbicide labels are only in metric units. Conversion between the Metric and Imperial system may result in confusion. It is recommended to use metric units only.

Afolan F (linuron) + MCPA (1:2) - Tank-Mix

Activity: Afolan F — 450 g active ingredient/litre
MCPA amine — 500 g active ingredient/litre

Registered Uses:
Crops
Wheat (spring, durum), oats, barley

Recommended Rates of Product
AFOLAN F 0.47-0.62 L/ha (0.19-0.25 L/ac) + MCPA amine 1.1 L/ha (0.45 L/ac)

At 0.47-0.62 L/ha one 10 litre container treats 21.3-16.1 ha (52.6-40 ac).

Weeds controlled: Wild buckwheat, tartary buckwheat, green smartweed, cow cockle, hemp-nettle, corn spurry, chickweed, redroot pigweed, prostrate pigweed, Canada thistle top growth. All weeds controlled by 1.1 L/ha MCPA (0.45 L/ac).[1]

Application:

1. Apply in 100 L of water per ha (40 L/ac).
2. Use the lower rates when growing conditions and rainfall are above average.
3. When using a flowable formulation certain precautions and sprayer adjustments must be made to ensure that it is applied correctly. Be sure that the sprayer is equipped with 50 mesh line strainers and screens. Stainless steel or hardened stainless steel nozzles are recommended. Also, pumps must be of sufficient capacity for adequate agitation through the by-pass or jet agitator which should terminate in the bottom of the tank.

Note: A jet agitator should never be put on the end of the by-pass line because a high back pressure develops on the pump and system when the booms are shut off.

Timing:

Apply when the weeds are in the 1-4 leaf stage. Hemp-nettle must be treated before the full 4-leaf stage.

Apply when the cereal crop is in the 2-4 leaf stage. **Application after the 4-leaf stage of cereals can result in severe crop damage especially on sandy soils under good moisture conditions.**

Mode of Action:

Linuron is a systemic herbicide which is absorbed through both the foliage and the root system of the plant. Once in the plant, its mode of action is to strongly inhibit photosynthesis. Outward appearance of affected plants is chlorosis (yellowing), stunting, and finally death which occurs in 10-14 days after treatment.

Precautions:

1. DO NOT use when crops are under drought stress.
2. DO NOT use on crops underseeded to forage crops.
3. DO NOT graze or feed green plants to livestock.
4. DO NOT re-treat field with a second application of linuron during the same crop year as injury to the crop may result.
5. DO NOT freeze liquid formulations.
6. DO NOT apply if rain is expected within one hour.

Mixing:

1. When mixing AFOLAN F with MCPA, the following is recommended:
   (a) Fill sprayers half full with clean water.
   (b) Shake the sealed Afolan F container vigorously.
   (c) Slowly add Afolan F to sprayer tank while the bypass or jet agitator is operating.
   (d) Empty the Afolan F container completely, letting it drain in a vertical position for 30 seconds.
   (e) Add rinse water to the container until one quarter full, shake vigorously, and repour into tank. Repeat this procedure three times.
   (f) Add MCPA.
   (g) Fill tank to required water level and spray. Continuous agitation is required.

Note: DO NOT leave linuron in the spray tank overnight or vigorous agitation with a paddle will be required to resuspend the chemical.

2. Mix AFOLAN F at 0.47 L/ha (0.19 L/ac) with Target at 1.1-1.5 L/ha (0.40-0.61 L/ac) for control of broadleaf weeds in wheat, barley and oats.

[1]amine formulation. See page 72.

Asulox F (asulam)

Activity: 400 g active ingredient/litre

Registered Uses:

Crops	Recommended Rate of Product
Flax, seedling and established seed alfalfa	2.75 L/ha (1.10 L/ac)

At 2.75 L/ha one 20 litre container treats 7.3 ha (18.0 ac).

Weeds controlled: Wild Oats. Suppression of wild mustard, stinkweed, bluebur, wild buckwheat, smartweed, lady's-thumb, green foxtail (wild millet), barnyard grass when sprayed in the seedling stage.

Application:

Apply in 50-100 L of water/ha (20-40 L/ac) at a pressure of 275 kPa (40 psi).

Timing:

For best results, apply when wild oats are in the 2-4 leaf stage and the flax is 2.5-15 cm (1-6 in.) tall. Do not spray seedling alfalfa before the first trifoliate leaf stage. Asulox will give suppression of several weeds other than wild oats when applied from the 1-3 leaf stage of these weeds. However, time the application to give best control of wild oats. Do not wait for possible later emergence of other weeds.

Mode of Action:

1. Asulox F checks growth of wild oats shortly after spraying but the full effect of the treatment may not be noticed for 2-4 weeks.
2. Temporary slight yellowing of the flax leaves may be seen a few days after spraying. Crop recovery from WILD OAT COMPETITION may be slow if the weeds have been allowed to smother the flax. Some reduction in crop height and delay in maturity may be noticed.

Precautions:

1. DO NOT spray when the crop is under stress due to drought, or in hot humid weather or when foliage is wet from rain or dew.
2. DO NOT spray if rain is expected within 8 hours.
3. DO NOT freeze.
4. DO NOT graze or feed treated crop.

Mixing:

1. Mix ASULOX F at the recommended rate with BUCTRIL-M (560) at 0.75 L/ha (0.30 L/ac) to control wild oats and broadleaf weeds in flax. Apply in 100 L of water/ha (40 L/ac) when wild oats are in the 2-4 leaf stage and the flax is 5-10 cm (2-4 in.) tall. Do not apply during hot humid weather or when flax is under stress.
2. DO NOT mix with TCA, Dalapon, or 2,4-D as crop damage may occur.

Avadex BW (triallate)

Activity: 400 g active ingredient/litre
10% Granules

Registered Uses:

Crops	Recommended Rates of Product			
	Spring Granular[2]	Spring Liquid[2]	Fall Granular	Fall Liquid
Wheat (spring, durum)				
before seeding[1]	11-14 kg/ha (4.5-5.7 kg/ac)	3.0-3.5 L/ha (1.20-1.40 L/ac)	11-17 kg/ha[3] (4.5-6.9 kg/ac)	3.0-4.25 L/ha[5] (1.20-1.70 L/ac)
after seeding	14-17 kg/ha (5.7-6.9 kg/ac)	3.5-4.25 L/ha (1.40-1.70 L/ac)	—	—
			—	—
Barley	14-17 kg/ha (5.7-6.9 kg/ac)	3.5-4.25 L/ha (1.40-1.70 L/ac)	11-17 kg/ha[3] (4.5-6.9 kg/ac)	3.0-4.25 L/ha[5] (1.20-1.70 L/ac)
Canola, Flax and Mustard	17-22 kg/ha (6.9-8.9 kg/ac)	4.25-5.5 L/ha (1.70-2.22 L/ac)	14-22 kg/ha[4] (5.7-8.9 kg/ac)	3.5-5.5 L/ha[6] (1.40-2.22 L/ac)
Peas	Not Recommended	4.25 L/ha (1.70 L/ac)	- Not Recommended -	

[1] DO NOT APPLY this product before seeding wheat in soils with 4% or less organic matter (brown, dark brown or grey-wooded soil zones) where discers are to be used for the seeding operation. If an air seeder is to be used, it must be equipped with a depth control device to ensure accurate seed placement, otherwise crop injury may occur.

[2] Where a rate range is shown, use the lower rate on soils with 4% or less organic matter and the higher rate on soils with greater than 4% organic matter.

[3] Use 11 kg/ha (4.5 kg/ac) on soils with less than 2% organic matter, 14 kg/ha (5.7 kg/ac) on soils with 2-4% organic matter and 17 kg/ha (6.9 kg/ac) on soils with greater than 4% organic matter.

[4] Use 14 kg/ha (5.7 kg/ac) on soils with less than 2% organic matter, 17 kg/ha (6.9 kg/ac) on soils with 2-4% organic matter and 22 kg/ha (8.9 kg/ac) on soils with greater than 4% organic matter.

[5] Use 3.0 L/ha (1.20 L/ac) on soils with less than 2% organic matter, 3.5 L/ha (1.40 L/ac) on soils with 2-4% organic matter and 4.25 L/ha (1.70 L/ac) on soils with greater than 4% organic matter.

[6] Use 3.5 L/ha (1.40 L/ac) on soils with less than 2% organic matter, 4.25 L/ha (1.70 L/ac) on soils with 2-4% organic matter and 5.5 L/ha (2.22 L/ac) on soils with greater than 4% organic matter.

At 3.5-4.25 L/ha one 22.7 litre container treats 6.5-5.3 ha (16.2-13.2 ac). At 14-17 kg/ha one 22.7 kg bag treats 1.62-1.34 ha (4.0-3.3 ac).

Underseeding:
Forage legumes such as alfalfa, trefoil and clovers may be seeded with labelled crops treated with Avadex BW herbicide provided the legumes are not harvested for green crop, silage or hay in the year of seeding.

Weeds controlled: Wild oats.

Formulations:

Liquid Formulation - Use on soils that are free of trash. Incorporate as soon as possible on the day of spraying, preferably immediately. On hot windy days, large losses can result from delayed incorporation. Apply in 100 L of water/ha (40 L/ac) at 200 kPa (30 psi).

Granular Formulation - Use on all soils including those carrying heavy trash cover. Granular Avadex BW is especially well suited to fall application.

Application:

Spring - Use before seeding canola, mustard, peas or flax. Use before or after seeding barley or wheat. DO NOT APPLY this product before seeding wheat in soils with 4% or less organic matter (brown, dark brown or grey-wooded soil zones) where discers are to be used for the seeding operation. If an air seeder is to be used, it must be equipped with a depth control device

to ensure accurate seed placement, otherwise crop injury may occur. Incorporate immediately according to directions.

Fall - Apply after September 15 and before freeze-up and incorporate. **Note:** In long open falls, early application prior to October 1 may lead to excessive Avadex BW losses and a reduction in wild oat control. Till the following spring at depths no greater than 6 cm (2.5 in.) to avoid dilution of the chemical which could result in reduced wild oat control and possible injury to sensitive crops such as wheat and barley.

The margin of crop safety is not as great when wheat is seeded into soil which has been fall treated with Avadex BW as when the chemical is is applied after seeding in the spring since it is extremely difficult to accurately place the seed below the fall treated layer of soil. This is especially true on heavy clay soils. When seeding wheat into fall treated soils, very careful attention must be paid to placing the seed at a uniform depth of 6-7.5 cm (2.5-3 in.). Placement of the seed into treated soil will result in stand reductions and delayed maturity.

Incorporation

A. Spring

Applied after seeding - Avadex BW applied after seeding wheat or barley should be incorporated with a double harrowing at right angles. This is the preferred method for use with wheat where drills are used. The double harrowing may dry out the soil sufficiently to inactivate the herbicide. A light rain within 2-3 weeks of application is then required for re-activation.

Applied at seeding - Avadex BW can be applied at seeding by mounting a spray boom or granular applicator behind a discer and applying the herbicide during the seeding operation. With proper adjustments, this provides excellent wild oat control, crop safety and minimum disturbance and drying of the soil. This is the preferred treatment for barley and wheat in areas where discer seeders are used. Fields should be harrowed after seeding to ensure adequate mixing of the chemical in the soil.

Applied before seeding - The most satisfactory incorporation is with a disc-type implement set to cut 6 cm (2.5 in.) deep followed by harrowing at right angles. Cultivators do not give as satisfactory incorporation and may result in wild oat misses. If a cultivator is used, a vibrashank type is preferred. It should be set to cut 6 cm (2.5 in.) deep followed by a harrowing at right angles. A double harrowing at right angles will also give satisfactory incorporation provided the soil is loose and free of trash cover allowing the harrows to penetrate.

B. Fall

When applied in the fall Avadex BW requires incorporation to hold the chemical in position and reduce overwintering losses to a minimum. It is possible, however, to delay a part of the incorporation procedures until spring. This is especially true when using the granular formulation.

In **stubble**, the use of the granular formulation is recommended since trash cover must be destroyed prior to using the liquid formulation. Hard or lumpy ground should be disced once prior to application to ensure proper mixing of the granules. The most satisfactory incorporation is with a disc-type implement set to cut 6 cm (2.5 in.) deep followed by a harrowing at right angles. Cultivators do not give as satisfactory incorporation and may result in wild oat misses. If a cultivator is used, a vibrashank type is preferred. It should be set to cut 6 cm (2.5 in.) deep and followed by a harrowing at right angles. In both cases (disc or cultivator incorporation) the second incorporation can be delayed until spring. If a deeper working of the field is desired, this deeper working should be carried out in the fall before Avadex BW is applied.

On **summerfallow**, incorporation should be accomplished with a disc followed by a harrowing at right angles, a vibrashank cultivator followed by a harrowing at right angles or double harrowing. The second operation can be delayed until spring.

If summerfallow must be ridged in the fall to prevent soil erosion the granular formulation should not be used in the fall. If soil must be ridged after incorporating liquid Avadex BW the depth of the ridging should be kept to a minimum as deep ridging may decrease the wild oat control or cause crop injury. On fields where erosion is a threat, spring application or the use of a post emergent product is preferred over fall treatment with Avadex BW.

Seeding Depth:

Canola, mustard, peas and flax have good tolerance to Avadex BW and can be planted into the treated layer at normal depth for these crops. Since barley and wheat are more sensitive, they should be planted 6-7.5 cm (2.5-3 in.) deep to reduce the chance of crop injury. It is especially important that wheat seed be below the treated layer of soil.

General:

Some wild oat seedlings may emerge before being killed. As growth ceases, the leaves become brittle and bluish green in color.

Seedlings that germinate in treated soil are killed quite rapidly. Seedlings that germinate below the treated layer are killed more slowly and the amount of growth prior to death increases as the depth of the seed increases. A seedling emerging from a depth of 15 cm (6 in.) may reach a height of more than 5 cm (2 in.) before it dies. On the other hand, wild oat plants that reach the two- leaf stage before the Avadex BW is activated by sufficient moisture may still be controlled.

Under normal conditions, Avadex BW will not leave a harmful residue in the soil to affect following crops. Under dry conditions, however, some Avadex BW may carry over. Therefore, oats should not be sown the year following application of Avadex BW.

Precautions:

1. The liquid formulation should be protected from freezing. If it does freeze it can be reconstituted by warming to 20 C and agitating.
2. Fall application is not recommended on soils where a lack of trash cover combined with the required operation could result in soil erosion.
3. For all Avadex BW treatments, wheat and barley must be seeded below the treated layer at a uniform depth of 6-7.5 cm (2.5-3 in.). DO NOT seed deeper than 7.5 cm (3 in.).
4. The margin of safety is not as great when wheat is seeded into soil which has been fall treated with Avadex BW as when the chemical is applied after seeding in the spring since it is extremely difficult to accurately place the seed below the treated layer of soil. This is especially true on heavy clay soils. Seed placement at the bottom of the cut of the disc can be improved by lengthening the tubes through which the seed falls, thus reducing the free fall distance of the seed. When seeding wheat into fall treated soils, very careful attention must be paid to placing the seed at a uniform depth of 6-7.5 cm (2.5-3 in.). Placement of the seed into treated soil will result in stand reductions and delayed maturity.
5. There are no grazing restrictions for crops other than forage legumes.
6. Rainfall or moisture is necessary for activation. Rainfall before incorporation may increase the loss of Avadex to the atmosphere.

Mixing:

1. Mix AVADEX BW (liquid formulation) at rates recommended for use in **wheat** or **barley** with:

   (a) TREFLAN (liquid formulation) at 1.1 L/ha (0.45 L/ac) on light soils and 1.5 L/ha (0.61 L/ac) on medium to heavy soils or;

   (b) RIVAL (liquid formulation) at 1.2 L/ha (0.49 L/ac) on light soils and 1.6 L/ha (0.65 L/ac) on medium to heavy soils; for control of wild oats and green foxtail (wild millet). Use only on fields 70% free of trash. Apply in 100 L of water/ha (40 L/ac) after seeding and incorporate with a double harrowing at right angles. Seed should be placed 5-7.5 cm (2-3 in.) deep.
2. Avadex BW liquid may be applied in combination with dry urea fertilizer or dry mixed fertilizers (not ammonium nitrate) in either spring or fall. A minimum of 150 kg/ha (60 kg/ac) of dry fertilizer must be used to ensure uniform distribution of the herbicide. Sufficient Avadex BW must be blended with the fertilizer (using commercial fertilizer blending equipment only) to give the correct rate of chemical for the fertilizer rate being used to a maximum of 4.25 L/ha (1.70 L/ac). Spread the fertilizer as soon as possible after blending with a properly calibrated and adjusted spreader. Spin spreaders should be calibrated to apply the desired rate per hectare and application overlapped by doubling back to cover 1/2 of the previous swath. Dribble spreaders must be calibrated with the fertilizer chemical mixture since the flow pattern will be slower than for straight dry urea. Incorporate immediately after spreading using normal Avadex BW procedures. Only pre-plant incorporated applications are recommended in the spring. For best results with spring pre-plant applications, delay the second incorporation for at least 24 hours.
3. To apply Avadex BW in conjunction with fall fertilizer banding a granular applicator may be mounted such that Avadex granules are broadcast prior to the first row of openers or shanks of the banding unit.

   The banding openers/shanks alone may be used for incorporation or may be followed by tine harrows as required for trash management. To obtain maximum performance with Avadex BW, follow Avadex BW banding guidelines. Note: There must be adequate soil mixing to cover the granules.

Avenge 200-C, Avenge 640 (difenzoquat)

Activity: Avenge 200-C 200 g active ingredient/litre

Avenge 640 64% water soluble powder

Registered Uses:

Crops	Recommended Rates of Product	
	Avenge 200-C	**Avenge 640**
Barley, wheat (Benito, Canuck, Chester, Columbus, Fielder, Glenlea, HY320, Katepwa, Leader, Macoun, Neepawa, Selkirk), Winter wheat (Norstar, Sundance), Triticale (Welsh, Carman), Fall Rye (Cougar, Puma, Frontier, Kodiak), Canary seed	3.5-4.25 L/ha (1.40-1.70 L/ac)	1.1-1.3 kg/ha (0.45-0.53 kg/ac)

At 3.5-4.25 L/ha one 20 litre container treats 5.7-4.7 ha (14.1-11.6 ac).
At 1.1-1.3 kg/ha one 20 kg container treats 18.2-15.4 (45-38 ac).

Underseeding:
Forage crops: Alfalfa, sweet clover, red clover, bird's-foot trefoil, creeping red fescue, meadow fescue, bromegrass, timothy, crested wheatgrass, orchardgrass, Russian wild ryegrass, reed canarygrass, Kentucky bluegrass may be seeded with wheat or barley and treated with Avenge alone, provided the forages are not to be grazed or harvested for feed during the year of seeding.

Weeds controlled: Wild oats.

Application:

1. Use the higher rate when the wild oat density exceeds 200 per square metre. Apply the lower rate when the wild oat density is between 1-200 plants per square metre. For best results apply when the crop and wild oats are growing vigorously.
2. For ground application apply in 100 L of water/ha (40 L/ac). Pressure at the nozzle tips should be 275 kPa (40 psi) and the boom should be rotated to direct the spray pattern 45 degrees forward.
3. For aircraft application apply in 20-50 L of water/ha (8-20 L/ac).
4. When using Avenge 640 a surfactant must be added. Add Agral 90 or Agsurf at 0.6 L/ha (0.24 L/ac) or 0.6% by volume. Fill the tank 3/4 full with clean water than add required quantity of Avenge 640 and surfactant. Add additional water required. Circulate the spray mixture in the tank for 5 minutes before spraying begins to ensure thorough mixing.

Timing:

1. Apply when the majority of the wild oats are in the 3-4 leaf stage to minimize early wild oat competition and provide maximum yield increases. Avenge applied at the 4-5 leaf stage may give better control of wild oats but yield increases may be reduced due to the competition which occurs prior to control. Avenge will not control wild oat plants that are in the 1-2 leaf stage.
2. Apply before the crop is past the 6-leaf stage.

Mode of Action:

1. The activity of Avenge is primarily through contact action. Therefore, good spray coverage is essential.
2. Under cool weather conditions or under high humidity the crop may show some initial burning on lower leaves, however, there generally will be no adverse effects on crop maturity or yield.
3. Avenge controls wild oats by stopping their growth. Obvious signs of plant death may not be seen for 3 to 4 weeks but the competitive effect of these plants will have been removed.

Precautions:

1. DO NOT hold spray solutions in galvanized tanks for more than 24 hours.
2. Wash sprayer out thoroughly with water after spraying.
3. DO NOT apply when plants are wet with dew or rain.
4. DO NOT apply if rain is forecast within six hours.
5. DO NOT apply if frost is forecast the same evening.

6. If Avenge 200-C is stored below 5 C salting out will occur. This can be reversed by warming and agitating.

7. DO NOT graze or feed forage crops during the year of establishment, or other crops 8 weeks after treatment.

8. DO NOT apply if the crop is under extreme drought stress or is showing effects of excessive moisture (poor drainage).

Mixing:

1. To control wild oats and broadleaf weeds in barley, canary seed and listed varieties of wheat AVENGE 200-C at 3.5-4.25 L/ha (1.40-1.70 L/ac) or AVENGE 640 at 1.1-1.3 kg/ha (0.45-0.53 kg/ac) may be tank-mixed with any of the following.

   (a) BUCTRIL-M (560) at 1.0 L/ha (0.40 L/ac).
   (b) ESTAPROP at 1.75 L/ha (0.71 L/ac). Wheat and barley only.
   (c) SABRE or BROMOX 720 M at 0.78 L/ha (0.32 L/ac).
   (d) PARDNER at 1.0 L/ha (0.40 L/ac) (DO NOT apply by aircraft).
   (e) TORCH DS at 625 mL/ha (253 mL/ac) (DO NOT apply by aircraft).
   (f) MCPA ester at 1.1 L/ha (0.45 L/ac)
   (g) 2,4-D LV ester (600 g active ingredient/litre) at 0.70-0.90 L/ha (0.28-0.38 L/ac). DO NOT apply to canary seed.
   (h) 2,4-DB (Embutox 625, Butyric 400 or Cobutox) at recommended rates. DO NOT apply to canary seed.

Apply AVENGE and broadleaf herbicide tank mixes in 100 L of water/ha (40 L/ac) when the wild oats are in the 3-5 leaf stage. Add the broadleaf herbicide at the start of filling then fill tank to 3/4 and add AVENGE and surfactant if required. Top off spray tank with remaining water. Note: When using SABRE, BROMOX 720 M or TORCH DS in a tank-mix continuous agitation is important.

2. Mix AVENGE 200-C at 4.25 L/ha (1.70 L/ac) or Avenge 640 at 1.3 kg/ha (0.53 kg/ac) with GLEAN at 15-30 g/ha to control wild oats and broadleaf weeds in barley and the listed varieties of wheat grown in soils with a pH of 7.5 or lower. Precisely follow all use directions regarding crop rotation on the GLEAN label. DO NOT apply the tank-mix to canary seed. DO NOT use this tank-mix during periods of stress (ie: dry conditions, low humidity or when plants are not actively growing) since applications under these conditions may result in significantly reduced wild oat control. DO NOT apply the tank-mix with GLEAN by aircraft. Note: Ensure Glean is in suspension before adding AVENGE; if AVENGE is added first, then the GLEAN must be pre-slurried before it is added. DO NOT add a surfactant when tank-mixing Avenge 200-C with Glean. Add Agral 90 or Ag Surf at 0.6% by volume when tank mixing Avenge 640 with Glean.

3. DO NOT mix AVENGE with 2,4-D amine, MCPA amine, BANVEL, SENCOR, LEXONE, LOROX, AFOLAN, BLAGAL, STAMPEDE 360, STAMPEDE CM, TARGET, or mixtures containing these products. Allow an interval of 6 days between the use of AVENGE and application of these herbicides.

4. DO NOT mix AVENGE with ANY broadleaf herbicide, except 2,4-DB, for use on underseeded forages.

Banvel LH, Banvel Herbicide (dicamba)

Activity: Banvel LH 400 g active ingredient/litre

Registered Uses:		**Recommended Rates of Product**	
Crops	**Banvel LH**	**Banvel LH + 2,4-D[1]**	**Banvel LH + MCPA[1]**
Wheat (spring, durum, winter), oats, spring rye	275-350 mL/ha (111-142 mL/ac)	275-350 mL/ha + 850 mL/ha (111-142 mL/ac + 344 mL/ac) Not Recommended on Oats	275-350 mL/ha + 850 mL/ha (111-142 mL/ac + 344 mL/ac) Not Recommended on Spring Rye
Barley	275 mL/ha (111 mL/ac)	275 mL/ha + 850 mL/ha (111 mL/ac + 344 mL/ac	275 mL/ha + 850 mL/ha (111 mL/ac + 344 mL/ac)
Canary Seed	350 mL/ha (142 mL/ac)	—	350 mL/ha + 850 mL/ha (142 mL/ac + 344 mL/ac)

At 275-350 mL/ha one 10 litre container treats 36.4-28.6 ha (89.9-70.6 ac).

Activity: Banvel Herbicide 480 g active ingredient/litre

Registered Uses:		**Recommended Rates of Product**	
Crops	**Banvel**	**Banvel + 2,4-D[1]**	**Banvel + MCPA[1]**
Wheat (spring, durum, winter), oats, spring rye	230-290 mL/ha (93-117 mL/ac)	230-290 mL/ha + 850 mL/ha (93-117 mL/ac + 344 mL/ac) Not Recommended on Oats	230-290 mL/ha + 850 mL/ha (93-117 mL/ac + 344 mL/ac) Not Recommended on Spring Rye
Barley	230 mL/ha (93 mL/ac)	230 mL/ha + 850 mL/ha (93 mL/ac + 344 mL/ac)	230 mL/ha + 850 mL/ha (93 mL/ac + 344 mL/ac)
Canary Seed	290 mL/ha (117 mL/ac)	—	290 mL/ha + 850 mL/ha (117 mL/ac + 344 mL/ac)

At 230-290 mL/ha one 9.5 litre container treats 41.3-32.8 ha (102-80.9 ac).

Weeds controlled by Banvel + 2,4-D or MCPA tank mixes: Bluebur, tartary buckwheat, wild buckwheat, burdock, field bindweed top growth, cleavers, cow cockle, cocklebur, flixweed, lamb's-quarters, ball mustard, dog mustard, hare's-ear mustard, Indian mustard, tumble mustard, wild mustard, wormseed mustard, prostrate pigweed, redroot pigweed, Russian pigweed, wild radish, common ragweed, false ragweed, giant ragweed, Russian thistle, shepherd's-purse, annual smartweed species, lady's-thumb, annual sow-thistle, perennial sow-thistle top growth, stinkweed, Canada thistle top growth, corn spurry, tame buckwheat, kochia, volunteer sunflower.

[1]These rates are for the amine formulations of 2,4-D & MCPA (500 g active ingredient/litre). For rates of other 2,4-D & MCPA formulations see conversion factors on page 73.

Application:

Use at least 100 L of water/ha (40 L/ac) to reduce the risk of crop injury. Use the low recommended rate of product for application by aircraft.

Timing:

1. Spray at the 3-4 leaf stage of wheat and oats and the 3-leaf stage of barley. Treatment at the 3-leaf stage of the crop will usually combine maximum crop tolerance and weed susceptibility. In winter wheat apply in spring when crop is 15-25 cm (6-10 in.) tall, before the shot blade stage. In canary seed apply when crop is at the 3-5 leaf stage. In spring rye apply when crop is at the 2-3 leaf stage.
2. Application at higher rates or after the 4-leaf stage or at low water volumes will usually result in stem bending and delayed maturity. Under conditions conducive to prolific tillering the yield may also be reduced.

Very severe yield losses due to sterility will result from treatment during the flag leaf stage to the early heading stage.

Mode of Action:

Banvel is a translocated herbicide which affects the roots of the plant. It is slower acting than most other broadleaf herbicides and death of the plants may take 2-3 weeks.

Precautions:

1. DO NOT use on cereals or grasses underseeded to legumes.
2. DO NOT freeze Banvel LH formulation.
3. DO NOT apply if rainfall is expected within 4 hours.
4. If treated vegetation has been consumed by meat animals within 30 days of application, feed the animals with untreated diet for 30 days before slaughter.
5. DO NOT graze or harvest cereal crops for livestock feed prior to crop maturity.

Sprayer Clean-up:

Banvel alone or Banvel plus 2,4-D or MCPA;

1. Hose down thoroughly the inside as well as outside surfaces of equipment while filling the spray tank half full of water. Flush by operating sprayer until the system is purged of the rinse water.
2. Fill tank with water while adding one litre of household ammonia for every 100 litres of water. Operate the spray pump to circulate the ammonia solution through the sprayer system for 15 to 20 minutes and discharge a small amount of the ammonia solution through the spray boom and nozzles. Let the solution out of the spray tank through the boom.
3. Remove the nozzles and screens and flush the system with two tank fulls of water.

Banvel plus other herbicides (ie: wettable powders, emulsifiable concentrates or other types of water dispersible formulations);

1. Complete, step 1 from above.
2. Fill tank with water while adding 1.0 kg of detergent for every 150 litres of water. Operate the pump to circulate the detergent solution through the sprayer system for 5-10 minutes and discharge a small amount of the solution through the boom and nozzles. Let the solution stand for several hours, preferably overnight.
3. Flush the detergent solution out of the spray tank through the boom.
4. Repeat step 1 and following with steps 2, 3 and 4.

Mixing:

1. Mix BANVEL at rates recommended for use in wheat, oats, canary seed and barley with:

   (a) MCPA amine at 0.85 L/ha (0.34 L/ac) or;
   (b) MCPA SODIUM SALT at 1.4 L/ha (0.57 L/ac) or;
   (c) MCPA POTASSIUM SALT at 0.7-1.1 L/ha (0.28-0.45 L/ac). For canary seed use MCPA amine only.

2. Mix BANVEL at rates recommended for use in wheat, spring rye and barley with 2,4-D amine at 0.85 L/ha (0.34 L/ac).
3. Mix BANVEL LH at 275 mL/ha (111 mL/ac) or BANVEL HERBICIDE at 230 mL/ha (93 mL/ac) with:

   SENCOR 500 at 275-425 mL/ha (111-172 mL/ac) or LEXONE DF at 275 g/ha (111 g/ac) on barley and wheat at the 2-3 leaf stage.

   DO NOT apply to Klondike, Johnston or Leduc barley. Allow a 4-5 day interval between the use of these mixtures and the application of a wild oat herbicide.
4. Allow a 4-7 day interval between the use of these tank mixes and the application of a wild oat herbicide. Length of interval depends on wild oat herbicide selected.

Basagran (bentazon)

Activity: 480 g active ingredient/litre

Registered Uses:
Crops
Peas, Fababeans, Flax

Recommended Rates of Product
1.75-2.25 L/ha (0.71-0.91 L/ac)

At 1.75-2.25 L/ha one 10 litre container treats 5.7-4.4 ha (14.1-11.0 ac).

Weeds controlled: Wild mustard, stinkweed, lady's-thumb, smartweed, redroot pigweed, lamb's-quarters, Russian thistle, cocklebur, purslane, corn spurry, common groundsel, common chickweed when sprayed in the seedling stage. For top growth control of Canada thistle a repeat application 7-10 days after the first application is required.

Application:

1. Apply post-emergence in 220 L of water/ha (90 L/ac) at 275-425 kPa (40-60 psi).
2. Use the higher rate for pigweed, lamb's-quarters, and Russian thistle or when lady's-thumb, smartweed and cocklebur are advanced.
3. The addition of Citowett Plus at .25% of total spray mixture will improve the control of advanced weeds. DO NOT use Citowett Plus on fababeans or flax.
4. The addition of Assist Oil Concentrate at 0.5% of total spray mixture will improve the control of advanced weeds. DO NOT use Assist Oil Concentrate on peas.
5. Best results are obtained when Basagran is applied under high temperature conditions when weeds are actively growing.

Note: Slight leaf-yellowing, bronzing, speckling or burning may occur if the crop has been stressed by drought, flooding, hail or previous herbicide damage, or widely fluctuating temperatures.

Timing:

1. Apply after peas have 3 pairs of leaves.
2. Apply after fababeans are 10 cm (4 in.) tall.
3. Apply after flax is 5 cm (2 in.) tall.

Mode of Action:

Basagran is a contact herbicide so for best results weed leaf surfaces must be thoroughly covered by the spray.

Precautions:

1. DO NOT apply if rainfall is expected within 8 hours.
2. If Basagran is frozen, warm to room temperature and shake well.
3. There are no grazing or feed restrictions.

Mixing:

DO NOT tank-mix Basagran with other pesticides, fertilizers or spray adjuvants.

Basfapon, Dowpon M (dalapon)

Activity: 74% water soluble powder

Registered Uses:

Crops	Recommended Rates of Product
Flax, canola	1.1-1.5 kg/ha (0.45-0.61 kg/ac)
Peas	1.1 kg/ha (0.45 kg/ac)
Seedling alfalfa, bird's-foot trefoil	2.2-3.4 kg of Dowpon M/ha (0.90-1.32 kg/ac)
Tame buckwheat	0.55-0.85 of Basfapon/ha (0.22-0.34 kg/ac)

At 1.1-1.5 kg/ha one 25 kg container treats 22.7-16.7 ha (56.2-41.2 ac).

Weeds controlled: Green foxtail, other annual grasses.

Application:

1. Apply in 100-165 L of water/ha (40-65 L/ac) when the foxtail is in the 1-3 leaf stage. Use 300 L of water/ha (120 L/ac) for peas and legumes. Flax should be 10-15 cm (4-6 in.) tall. Canola should have 2-4 leaves. Pea vines should be 10-15 cm (4-6 in.) long. Seedling legumes should be 5-7.5 cm (2-3 in.) tall. Tame buckwheat should be in the 1-3 leaf stage.
2. Use the higher rate of heavy infestations or when foxtail is at a more advanced stage.

Timing:

Best results are obtained when applied to young weeds which are actively growing (1-3 leaf stage).

Mode of Action:

Dalapon is a growth inhibitor. Control symptoms may not become obvious for 2-3 weeks after treatment.

Precautions:

1. Dalapon is mildly corrosive to equipment. Therefore, flush spraying equipment with plenty of water immediately after use.
2. DO NOT feed treated crop residues to livestock as residues may appear in meat and milk.
3. DO NOT apply if rainfall is expected within 4 hours.

Mixing:

1. Mix BASFAPON or DOWPON M at the recommended rates with:

   (a) MCPA Amine at 0.7-1.1 L/ha (0.28-0.45 L/ac) or
   (b) MCPA SODIUM SALT at 1.2-1.9 L/ha (0.48-0.77 L/ac) in 100-165 L of water/ha (40-65 L/ac) for **flax**. Apply when the green foxtail is in the 1-3 leaf stage. Completely dissolve dalapon in water before adding MCPA.

Benazolin (benazolin)

Activity: 330 g active ingredient/litre

Registered uses:

Crops	**Recommended Rate of Product**
Canola	2.1 L/ha (0.85 L/ac)

At 2.1 L/ha one 5 litre container treats 2.4 ha (5.9 ac).

Weeds controlled: Wild mustard, Canada thistle top growth.

Application:

Apply in 50-100 L of water/ha (20-40 L/ac).

Timing:

Apply when the canola has 3-5 true leaves and the wild mustard has 2-4 leaves.

Mode of Action:

Similar to 2,4-D and MCPA.

Precautions:

1. DO NOT apply with a sprayer that is contaminated with 2,4-D or MCPA. See section on sprayer clean-out procedures.
2. Protect from freezing.
3. DO NOT apply if rainfall is expected within 4 hours.

Mixing:

DO NOT tank-mix BENAZOLIN with other pesticides, fertilizers or spray adjuvants.

Bladex TTC (cyanazine)

Activity: 480 g active ingredient/litre

Registered Uses:

Crops	Recommended Rate of Product
Triazine tolerant canola	3.0 L/ha (1.21 L/ac)

At 3.0 L/ha one 10 litre container treats 3.3 ha (8.2 ac).

NOTE: Use Bladex TTC only on triazine tolerant canola varieties OAC Triton or Tribute seed. Non-triazine tolerant canola will be killed by Bladex.

Weeds controlled: Wild mustard, stinkweed, wild buckwheat, redroot pigweed, chickweed, lamb's-quarters, hemp-nettle, cleavers, green smartweed, lady's-thumb, common groundsel, shepherd's-purse, volunteer canola (non-triazine tolerant).

Application:

Apply in 100 L of water/ha (40 L/ac) at a pressure of 275 kPa (40 psi). Use 50 mesh or larger in-line and nozzle screens. The use of flat fan spray nozzles is recommended to improve coverage. Do not use flood jet or hollow cone nozzles. The sprayer should be equipped with an agitation system sufficient to ensure thorough and constant mixing.

Timing:

Apply when the crop and weeds are in the 1-4 leaf stage. Optimum weed control is achieved when the weeds are small and actively growing; later applications will be less effective.

Mode of Action:

Cyanazine inhibits photosynthesis in susceptible weed species. Evidence of control should be clearly visible within 7 days of application.

Precautions:

1. DO NOT apply if rainfall is expected within 2 hours.
2. DO NOT allow the spray mixture to stand in the spray tank without agitation.
3. Thoroughly clean the sprayer before and after use to prevent damage to susceptible crops.
4. DO NOT overlap spray swaths.

Mixing:

Mix BLADEX TTC at the recommended rate with POAST at the recommended rates for control of broadleaf and grassy weeds in **Triazine Tolerant Canola**. Add Bladex to the spray tank first, followed by Poast, and the appropriate amount of Assist last. Maintain continuous agitation while filling and spraying. Apply when broadleaf weeds are in the 1-4 leaf stage and grass weeds are in the 1-6 leaf stage, no later than the 4-leaf stage of the crop. Do not mix with any other pesticides, fertilizers or spray adjuvants.

Blagal (cyanazine and MCPA-K 1:2)

Activity: 375 g active ingredient/litre

Registered Uses:

Crops	Recommended Rate of Product
Wheat (spring, durum)	2.25 L/ha (0.91 L/ac)
Barley	
Oats	

At 2.25 L/ha one 10 litre container treats 4.4 ha (11.0 ac).

Weeds controlled: Tartary buckwheat, wild buckwheat, smartweed, lady's-thumb, hemp-nettle, stinkweed, corn spurry, chickweed, lamb's-quarters, ball mustard, wild mustard, wormseed mustard, tumble mustard, top growth control of Canada thistle and field horsetail, other weeds controlled by 1.1 L/ha MCPA[1] (0.45 L/ac).

Application:

Apply in 100 L of water/ha (40 L/ac) at 200-300 kPa (30-44 psi). Thorough coverage is necessary for good results. Maintain continuous agitation during mixing and application. Use 50 mesh screens or larger. DO NOT use felt filters. DO NOT use flood jet or hollow cone nozzles.

Timing:

Apply when the cereal crop is in the 2-5 leaf stage. Spray after weeds have one true leaf and before they have five leaves.

Mode of Action:

Cyanazine inhibits photosynthesis causing yellowing of leaves and eventual death of susceptible plants. Crops under stress from lack of moisture or extreme temperatures may show temporary yellowing. MCPA susceptible weeds will show typical MCPA symptoms.

Precautions:

1. DO NOT overlap.
2. Avoid prolonged contact with skin.
3. DO NOT graze or feed the immature crop from the treated area to livestock.
4. DO NOT treat cereals underseeded to forage or green manure legumes.
5. DO NOT spray if rainfall is expected within 4 hours.

Mixing:

DO NOT mix with other herbicides or wetting agents.

[1]amine formulation - See page 72.

Buctril-M (bromoxynil and MCPA 1:1)

Activity: 560 g active ingredient/litre

Registered Uses:

Crops	Recommended Rate of Product
Wheat (spring, durum, winter), barley, oats, flax, fall rye, canary seed, seedling grasses (bromegrass, crested wheatgrass, intermediate wheatgrass, slender wheatgrass, tall wheatgrass, Russian wild ryegrass, timothy, orchardgrass, creeping red fescue, meadow fescue and reed canarygrass) when sown for seed production in the year of establishment only.	1.0 L/ha (0.40 L/ac)

At 1.0 L/ha two 8 litre containers treat 16 ha (39.5 ac).

Weeds controlled: Cow cockle (seedling to 4-leaf stage), green smartweed, lady's- thumb, Russian thistle (seedling to 5 cm (2 in.) high), tartary buckwheat, wild buckwheat, lamb's-quarters, stinkweed, wild mustard, redroot pigweed, night- flowering catchfly, kochia, common groundsel, ball mustard, flixweed, tumble mustard, wormseed mustard, scentless chamomile (spring annuals only), bluebur, shepherd's-purse, common ragweed, volunteer sunflowers, volunteer canola, cocklebur, American nightshade, top growth control of Canada thistle and perennial sow-thistle.

Application:

Apply in 100 L of water/ha (40 L/ac).

Timing:

1. Buctril-M can be safely applied in the spring to cereals from the 2-leaf stage until the appearance of the flag-leaf and to flax when the crop is 5-10 cm (2-4 in.) tall. Apply to seedling grasses in the 2-4 leaf stage and to canary seed in the 3-5 leaf stage. Best results are obtained from applications made at the early leaf stages.
2. Buctril-M can be applied in the fall to winter wheat in the 2-4 leaf stage.

Mode of Action:

Bromoxynil is a contact herbicide. Therefore thorough coverage of the weeds is required for good control.

Precautions:

1. In flax, some leaf burn and retarded growth may delay maturity 2-3 days. Severe injury may result if flax is treated when the plants are under stress.
2. DO NOT apply mixtures containing bromoxynil during hot, humid weather as this may result in temporary leaf scorch.
3. DO NOT apply if rainfall is expected within 30 minutes.
4. There are no grazing restrictions.

Mixing:

1. Mix BUCTRIL-M at 0.75 L/ha (0.30 L/ac) with ASULOX F at 2.75 L/ha (1.10 L/ac) to control wild oats and broadleaf weeds in **flax**. Apply in 100 L of water/ha (40 L/ac) when the wild oats are in the 2-4 leaf stage and the flax is 5-10 cm (2-4 in.) tall. DO NOT apply during hot humid weather or when flax is under stress.
2. Mix BUCTRIL-M at the recommended rate with AVENGE 200-C at 3.5-4.25 L/ha (1.40-1.70 L/ac) to control broadleaf weeds and wild oats in **barley** and those varieties of **wheat** and **fall rye** registered for Avenge. Apply in 100 L of water/ha (40 L/ac) when the wild oats are in the 3-5 leaf stage. Add the broadleaf herbicide at start of filling then fill tank to 3/4 full and add AVENGE 200-C. Top off spray with remaining water.
3. Mix BUCTRIL-M at the recommended rate with MCPA formulations at 0.56 L/ha (0.23 L/ac) to control hemp-nettle in **wheat**, **barley** and **oats**.
4. Mix BUCTRIL-M at the recommended rate with TCA at 1.3 kg/ha (0.53 kg/ac) to control green foxtail and broadleaf weeds in barley. In oats mix TCA at 1.3-2.7 kg/ha (0.53-1.10 kg/ac). Apply in 100-150 L of water/ha (40-60 L/ac) when green foxtail has 1-3 leaves and the crop 2-4 leaves.
5. Mix BUCTRIL-M at the recommended rate with POAST at recommended rates to control broadleaf and grassy weeds in flax. Apply in a minimum 100 L of water/ha (40 L/ac) when the grass weeds are in the 2-5 leaf stage and flax is 5-10 cm (2-4 in.) tall. Follow the mixing instructions as recommended for Poast (page 47). This tank- mix may increase the possiblity of crop scorch.

Dyvel (dicamba + MCPA K 1:4)

Activity: 420 g active ingredient/litre

Registered Uses:

Crops	Recommended Rate of Product
Wheat, (spring, durum, winter) barley, oats)	1.25 L/ha (0.51 L/ac)

At 1.25 L/ha one 10 litre container treats 8.0 ha (19.8 ac).

Weeds controlled: Hemp-nettle*, cow cockle, wild buckwheat, green smartweed, lady's thumb, corn spurry, Russian thistle, lamb's-quarters, pigweed (prostrate, redroot, Russian), mustards (except dog mustard), ragweeds, stinkweed, cocklebur, tartary buckwheat, kochia, cleavers*, volunteer sunflowers, flixweed, shepherd's-purse, wild radish, burdock, annual sow-thistle, top growth control of Canada thistle and perennial sow-thistle.

*Suppression only

Application:

Use at least 100 L of water/ha (40 L/ac) to reduce the risk of crop injury.

Timing:

1. Spray at the 2-4 leaf stage of wheat and oats and the 3-leaf stage of barley. Treatment at the 3-leaf stage of the crop will usually combine maximum crop tolerance and weed susceptibility. In winter wheat apply in spring when the crop is 15-25 cm (6-10 in.) tall, before the shot blade stage.
2. Application at higher rates or after the 4-leaf stage or at low water volumes will usually result in stem bending and delayed maturity. Under conditions conducive to prolific tillering, the yield may also be reduced. Very severe yield losses due to sterility will result from treatment during the flag leaf to the early heading stage.

Mode of Action:

Dyvel is a translocated herbicide, which affects the roots of the plant. It is slower acting than most other broadleaf herbicides and death of the plants may take 2-3 weeks.

Precautions:

1. DO NOT use on cereals underseeded to legumes.
2. DO NOT freeze.
3. DO NOT apply if rainfall is expected within 4 hours.
4. DO NOT graze or harvest for livestock feed prior to crop maturity.
5. For sprayer clean-up directions refer to Banvel.

Mixing:

DO NOT tank-mix DYVEL with other pesticides, fertilizers or spray adjuvants.

Embutox 625/2,4D Butyric 400/Cobutox (2,4-DB)

Note: These products are recommended for use on cereals underseeded to forage legumes (except sweet clover).

Activity:

Embutox 625	625 g active ingredient/litre
2,4D Butyric 400	400 g active ingredient/litre
Cobutox	400 g active ingredient/litre

Registered Uses:

Recommended Rates of Product

Crops	Butyric 400/Cobutox	Embutox 625
Wheat (spring, durum), barley, oats, seedling alfalfa, bird's-foot trefoil, alsike clover, red clover, white clover	2.75-3.5 L/ha (1.10-1.40 L/ac)	1.75-2.25 L/ha (0.71-0.91 L/ac)
Pastures containing forage legumes	2.75-4.25 L/ha (1.10-1.72 L/ac)	1.75-2.75 L/ha (0.71-1.10 L/ac)

At 2.75-3.5 L/ha one 20 litre container treats 7.3-5.7 ha (18.0-14.1 ac).
At 1.75-2.25 L/ha one 8 litre container treats 4.6-3.6 ha (11.3-8.8 ac).

Weeds controlled at 2.75 L/ha or 1.75 L/ha: Ragweed, redroot pigweed, mustards (wild, wormseed, ball), lamb's-quarters, stinkweed, shepherd's-purse.

Suppression or Top Growth Control at 3.5-4.25 L/ha or 2.25-2.75 L/ha: Oakleaf goosefoot, plantain, yellow rocket, chicory, wild buckwheat, wild radish, lady's-thumb, smartweed, bull thistle, perennial sow-thistle, Canada thistle, curled dock, narrow-leaved hawk's-beard, field bindweed, horsetail, dandelion.

Application and Timing:

1. Apply in 150-200 L of water/ha (60-80 L/ac) when the legumes are in the 1-4 trifoliate leaf stage and when the cereal crop is between the 4-leaf and flag-leaf stages.
2. In pastures containing forage legumes apply after cutting or grazing when the regrowth is not above 7.5 cm (3 in.) tall.

Mode of Action:

Mode of action is similar to 2,4-D and MCPA.

Precautions:

1. DO NOT use on sweet clover.
2. Oats are susceptible to damage if treated before 5-leaf stage.
3. Embutox 625 may be stored at freezing temperatures but must be returned to its original state by warming to room temperature (20-22 C) and agitating thoroughly on several successive days before use. DO NOT freeze 2,4D Butyric 400 or Cobutox.
4. Rainfall before foliage has dried from spraying may decrease activity.
5. There are no grazing restrictions.

Mixing:

1. Mix EMBUTOX 625 at 1.25 L/ha (0.51 L/ac) or 2,4D BUTYRIC 400 or COBUTOX at 2.0 L/ha (0.81 L/ac) with MCPA amine at 70 mL/ha (28 mL/ac) for improved control of wild mustard in **seedling alfalfa** and **bird's-foot trefoil**. This tank-mix may increase crop stunting.

Eptam-8E (EPTC)

Activity: 798 g active ingredient/litre
10% granular

Registered Uses:	**Recommended Rate of Product**	
Crops	**Granular**	**Liquid**
Sunflowers, flax*, seedling alfalfa	34 kg/ha (13.8 kg/ac)	4.25 L/ha (1.70 L/ac)

At 34 kg/ha one 22.7 kg bag treats 0.7 ha (1.7 ac).
At 4.25 L/ha one 20 L container treats 4.7 ha (11.6 ac).

Weeds controlled: Barnyard grass, corn spurry, green and yellow foxtail, wild oats, chickweed, lamb's-quarters, prostrate pigweed, purslane, redroot pigweed, tumble pigweed.

Application:

Apply to a dry, trash free soil surface in 100 L of water/ha (40 L/ac) and incorporate immediately.

Timing:

Apply in spring prior to seeding. Although registered, fall application is not recommended in Saskatchewan because of the risk of soil erosion due to the extent of incorporation required.

Incorporation:

Incorporate immediately. Tandem discs should be set to cut 10-15 cm (4-6 in.) and operate at a speed of 7-10 km/h (4.3-6.2 mph) and followed by a spike toothed harrow or some other leveling device which extends beyond the ends of the discs. On medium and heavy textured soils two workings at right angles are required. On light sandy soils, one operation may be adequate. One-way discs should be set to cut 12.5-15 cm (5-6 in.) deep and operated at 7-10 km/h (4.3-6.2 mph) and followed by a spike-toothed harrow or some other leveling device which extends beyond the ends of the discs. Cross discing is required for adequate incorporation. Field cultivators can be used in light soils which are in good tilth. Use 3 or 4 rows of sweeps spaced at 17.5 cm (7 in.) intervals or less followed by a spike- toothed harrow pulled behind the cultivator. Use 17.5 (7 in.) or wider sweeps. Set the cultivator to cut 12.5-15 cm (5-6 in.) deep and operate at a minimum of 10 km/h (6.2 mph). Run the equipment over the field twice. The second run should be at an angle to the first.

Mode of Action:

Eptam controls susceptible weeds by interfering with germination and normal seedling development.

Precautions:

*1. Although EPTAM-8E is registered for use in flax, it is not recommended for use in Saskatchewan because of the risk of crop phytotoxicity.
2. DO NOT apply to moist or trashy soil surfaces.
3. EPTAM-8E is volatile and will be lost rapidly especially from a wet soil surface. Incorporate within minutes of application, preferably in the same operation.
4. DO NOT freeze. If frozen, warm to room temperature and shake well on several successive days.
5. EPTAM-8E is not a persistent herbicide. Late germinating weeds may not be controlled. Therefore, seed as soon as possible after treatment. Shallow cultivation may be necessary to control late germinating weeds.
6. **Note:** Speeds in excess of 8 km/h (5 mph) will result in excessive pulverization and trash destruction leaving fields susceptible to erosion. The maximum recommended tillage depth for Saskatchewan is 10 cm (4 in.).
7. Eptam is very soluble in water and excessive moisture may leach Eptam from the surface.

Mixing:

EPTAM-8E may be tank-mixed with liquid and granular fertilizers except for nitrate based fertilizers. DO NOT mix with other pesticides or spray adjuvants.

Estaprop (dichlorprop and 2,4-D 1:1)

Activity: 600 g active ingredient/litre

Registered Uses:

Crops	Recommended Rate of Product
Wheat (spring, durum, winter), barley	1.75 L/ha (0.71 L/ac)

At 1.75 L/ha two 8 litre containers treat 9.14 ha (22.6 ac).

Weeds controlled: Annual sow-thistle, mustards (ball, dog, hare's-ear, Indian, tumble, wild, wormseed), bluebur, burdock, cocklebur, flixweed, kochia, lady's-thumb, lamb's- quarters, oak-leaved goosefoot, ragweeds, redroot pigweed, Russian pigweed, Russian thistle, shepherd's-purse, smartweeds, stinkweed, stork's-bill, tartary buckwheat, wild buckwheat, round-leaved mallow, night-flowering catchfly, volunteer canola and volunteer sunflower.

Top-growth control of Canada thistle, curled dock, perennial sow-thistle. Under poor growing conditions, lady's-thumb, smartweeds and buckwheats will be suppressed but not completely controlled.

Application:

Apply in 100 L of water/ha (40 L/ac).

Timing:

Apply from 4-leaf stage to just before the flag-leaf stage of the crop. Best results will be obtained when applied to rapidly growing weeds in the 2-4 leaf stage. In winter wheat apply in spring after full tillering but before the shot blade stage.

Mode of Action:

Similar to 2,4-D and MCPA.

Precautions:

1. Slight crop injury may result at 1.75 L/ha but where weed infestation is heavy this should be overcome by reduced weed competition.
2. DO NOT use on grain underseeded to legumes.
3. There is no information available on grazing restrictions or the effect of rainfall after application.
4. Damage to the crop may result if application is made before the 4-leaf stage.

Mixing:

1. Mix ESTAPROP at the recommended rate with AVENGE 200-C at 3.5-4.25 L/ha (1.40-1.70 L/ac) to control broadleaf weeds and wild oats in barley and those varieties of wheat registered for Avenge. Apply in 100 L of water/ha (40 L/ac) when wild oats are in the 3-5 leaf stage and the crop is at the 4-6 leaf stage. DO NOT apply before the 4-leaf stage of the crop. Add Estaprop at the start of filling then fill tank to 3/4 full and add Avenge. Top off tank with remaining water.
2. Do not mix Estaprop with any other pesticides, fertilizers or spray adjuvants.

Fortress (triallate & trifluralin 10:4)

Activity: 14% granules

Registered Uses: Crops	**Recommended Rates of Product Based on % Organic Matter[1]**			
	Less than 2%	**2-4%**	**4-6%**	**Greater than 6%**
Wheat (spring, durum)[2]	Not Recommended	11 kg/ha (4.5 kg/ac)	14 kg/ha (5.7 kg/ac)	17 kg/ha (6.9 kg /ac)
Barley[2]	11 kg/ha (4.5 kg/ac)	11 kg/ha (4.5 kg/ac)	14 kg/ha (5.7 kg/ac)	17 kg/ha (6.9 kg/ac)
Flax[2], canola and mustard	14 kg/ha (5.7 kg/ac)	14 kg/ha (5.7 kg/ac)	17 kg/ha (6.9 kg/ac)	17 kg/ha (6.9 kg/ac)

[1] Use on all soils as indicated including those carrying heavy trash cover. Fortress must be applied in fall to allow maximum dissipation and activation of the product.

[2] Wheat, barley or flax seeded into a fall application of this product must be seeded using either a hoe drill or double disc press drill only. In soils with less than 2% organic matter, hoe drills only are recommended. Seed must be placed below the treated layer to reduce the chance of crop injury.

At 11-17 kg/ha one 22.7 kg bag treats 2.1-1.3 ha (5.1-3.3 ac).

Weeds Controlled: Wild oats, green foxtail.

Application:

Apply in **fall** after September 15 and before freeze-up and incorporate.
Note: In long open falls, early application prior to October 1 may lead to excessive Fortress losses and a reduction in wild oat control. Till the following spring at depths no greater than 7.5 cm (3 in.) to avoid dilution of the chemical which could result in reduced weed control and possible injury to sensitive crops such as wheat and barley. When seeding wheat into fall treated soils, very careful attention must be paid to placing the seed at a uniform depth below the layer of treated soil. Placement of seed into treated soil will result in stand reduction and delayed maturity. Thinning is minimized when the seed is placed below the treated soil layer. Thinning is usually more than offset by increased tillering.

Field Preparation:

Before applying this product be sure the soil is in good working condition. All deep tillage by cultivation or double disc implements must be completed prior to application of this product. If excessive trash is present additional tillage or other appropriate trash management practice will be necessary to reduce the trash cover to an acceptable level before application as too much trash can make uniform incorporation difficult.

If the soil is excessively wet or lumpy making proper incorporation difficult, cultivation with suitable tillage equipment may be required before application and incorporation to improve the soil condition. If ridging is a problem, suitable tillage is recommended prior to application to eliminate the ridging and ensure uniform distribution of the herbicide.

Incorporation:

This product must be incorporated into the soil, using suitable tillage equipment, in order to provide weed control. Two incorporation operations at right angles to one another is necessary for thorough mixing of this product in the soil. The first incorporation should be completed within 24 hours of application. The second incorporation may be done during the fall or delayed, until the spring. A delay of the second incorporation for at least 5 days after the first incorporation will allow a greater release of product and more effective weed control.

Incorporate by setting the tillage equipment to work the soil no deeper than 7.5-10 cm (3- 4 in.). Shallow incorporation is necessary to prevent dilution of the product, thus decreasing weed control and increasing the risk of crop injury.

Harrowing does not provide effective incorporation if compact soil prevents penetration of harrow teeth or if trash accumulates in the harrow section or if harrows bounce.

Only one incorporation is required in the fall. The second incorporation may be done either in the fall (prior to soil freeze-up) or in the spring. If the second incorporation is done in the spring it may be done any time until crop emergence. If the second incorporation is conducted after seeding it should be done with a harrow or other suitable tillage equipment adjusted to a depth so as not to disturb the seed. If ridging is a problem after seeding, one harrowing is recommended to eliminate the ridging and ensure uniform distribution of the herbicide.

Seeding Depth:

Seed wheat and barley at a depth of 5-7.5 cm (2-3 in.). It is especially important that wheat seed be below the treated layer of soil to reduce the chance of crop injury. Do not seed deeper than 7.5 cm (3 in.). To ensure an even crop stand, increase the usual seeding rate of wheat or barley by 10%.

General:

Some wild oat seedlings may emerge before being killed. As growth ceases, the leaves become brittle and bluish green in color. Seedlings that germinate in treated soil are killed quite rapidly. Seedlings that germinate below the treated layer are killed more slowly and the amount of growth prior to death increases as the depth of the seed increases. A seedling emerging from a depth of 15 cm (6 in.) may reach a height of more than 5 cm (2 in.) before it dies. On the other hand, wild oat plants that reach the two- leaf stage before the Fortress is activated by sufficient moisture may still be controlled. Green foxtail seedlings will generally be controlled as they germinate.

Precautions:

1. Fall application is not recommended on soils where a lack of trash cover combined with the required incorporation operation could result in soil erosion.
2. Substantial thinning in wheat and barley following treatment has been known to occur especially under conditions of heavy rainfall and/or cold weather after application and before crop emergence. To minimize thinning pay careful attention to incorporation and seeding depth instructions.
3. Some wheat or barley injury may be noted on eroded knolls.
4. Oats, small-seeded forage grasses and canary seed should not be grown in rotation following a Fortress treated crop.
5. DO NOT apply Fortress for wheat on land which has been treated with Rival, Treflan, Heritage or Triflurex since June 1 of the previous year.
6. There are no grazing restrictions.
7. Rainfall or moisture is necessary for activation. Rainfall before incorporation may increase the loss of Fortress to the atmosphere.
8. Under conditions of prolonged cool soil temperatures at the time of germination or extreme drought in the spring, weed control may be reduced.

Mixing:

DO NOT mix Fortress with other pesticides or fertilizers.

Glean (chlorsulfuron)

Activity: 75% dry flowable

Registered Uses:

Crops	Recommended Rates of Product Wheat
Wheat (spring, durum, winter), barley oats	15-30 g/ha
Fall application prior to seeding spring wheat (excluding durum)	20-30 g/ha

At 15-30 g/ha one 500 g container treats 33.3-16.7 ha (82.4-41.2 ac).

Weeds controlled at 15 g/ha: Lamb's-quarters, hemp-nettle, wild mustard, cow cockle, volunteer rapeseed, redroot pigweed, stinkweed, lady's-thumb, green smartweed, flixweed.

Weeds controlled at 23 g/ha: Above weeds plus suppression of Russian thistle and wild buckwheat.

Weeds controlled at 30 g/ha: Above weeds plus chickweed, kochia, cleavers, wild buckwheat, Russian thistle and Canada thistle top growth.

Weeds controlled by fall application: Kochia, wild buckwheat, stinkweed, flixweed, volunteer canola, lamb's-quarters and wild mustard. Apply at 30 g/ha for suppression of green foxtail (wild millet).

Application:

Add the proper amount of Glean to the required volume of water in the spray tank with the agitator running. Continuous agitation is required to keep the product in suspension. After Glean has been well mixed and is in suspension then add a spray adjuvant (e.g. Agsurf, Agral 90, or Citowett Plus) at 100 mL for each 100 L of spray mixture (0.1% by volume). Apply only with ground equipment in a minimum of 60 L of water/ha (25 L/ac) with flat fan nozzles. When using flood jet or raindrop nozzles apply 225 L/ha (90 L/ac) total spray volume. Use 50-mesh screens or larger.

Timing:

1. Apply when wheat, barley or oats are in the 2-leaf to flag leaf stage. Apply to winter wheat after the crop has commenced growth in the spring up to the flag leaf stage. Best results are obtained when applied to small and actively growing weeds. Treat wild buckwheat at the 1-3 leaf stage and Canada thistle when 15 cm (6 in.) in height but before flowering.
2. In the fall, prior to planting spring wheat (excluding durum), apply Glean in the brown soil zones to control certain broadleaf weeds and suppress green foxtail the following season. For best pre-emergence results apply to undisturbed stubble fields where the straw has been spread evenly or to cultivated fields which have a uniform soil surface. If cultivation is necessary following application, do not cultivate more than 7.5 cm (3 in.) deep. In the spring use shallow tillage to prepare the seedbed. For best post- emergence results in the fall apply with a surfactant to small actively growing weeds.

Mode of Action:

Glean is a systemic herbicide and rapidly stops growth of susceptible plants. However, typical symptoms (discoloration and wilting) of control may not be noticeable for 7-10 days after treatment.

Precautions:

1. Apply only on land having a soil pH of 7.5 or lower.
2. At pH 7.0 or lower only wheat or barley may be seeded the season following a Glean spring application. At pH 7.0 to 7.5 only wheat may be seeded, barley may be seeded the second season (2 years) following a Glean spring application. Only spring wheat (excluding durum) may be seeded the season following a Glean fall application. In black soil zones, canola or peas may be seeded the third season (34 mo.) following the last application of GLEAN where soil organic matter is greater than 5% and soil pH is 7.0 or less. This interval may be reduced if a successful field bioassay has been completed.
3. FOR CROP ROTATION FLEXIBILITY DO NOT USE GLEAN ON ALL LAND IN WHEAT OR BARLEY PRODUCTION. Refer to product label for recropping guidelines.
4. DO NOT allow spray mixture to remain in the tank for more than 24 hours before spraying,

or effectiveness may be reduced. Use vigorous agitation to thoroughly disperse spray mixtures that have been allowed to stand in the tank.

5. DO NOT apply or allow drift onto desirable plants or non-target land areas, cropland, water, irrigation or drainage ditches.
6. DO NOT apply to wheat, barley or oats undersown with other crops as injury to other crops will occur.
7. DO NOT exceed a total of 30 g product/ha within a 12 month period.
8. DO NOT apply by aircraft.
9. Immediately after spraying, thoroughly clean all traces of Glean from application equipment to avoid possible injury to other crops.
   (a) Drain tank then flush tank, boom and hoses with clean water for a minimum of 10 minutes.
   (b) Fill tank with clean water, then add 1/2 litre chlorine bleach (containing 5 1/4% sodium hypochlorite) per 100 litres of water (0.5% by volume). Flush through boom and hoses then allow to sit for 15 minutes with agitation; then drain. Note: DO NOT use chlorine bleach with ammonia.
   (c) Repeat Step b.
   (d) Nozzles and screens should be removed and cleaned separately. To remove traces of chlorine bleach rinse tank thoroughly with clean water and flush through hoses and boom.
10. SEE LABEL FOR DETAILED PRECAUTIONS AND FOLLOW ALL LABEL DIRECTIONS.

Mixing:

1. Mix GLEAN at the recommended rates with AVENGE 200-C at 4.25 L/ha (1.70 L/ac) to control wild oats and broadleaf weeds in barley and those varieties of wheat registered for AVENGE 200-C. DO NOT add a surfactant when tank-mixing GLEAN with AVENGE 200-C. Apply in 100 L of water/ha (40 L/ac). DO NOT use this tank-mix during periods of stress (i.e. dry conditions, low humidity or when plants are not actively growing) since applications under these conditions may result in significantly reduced wild oat control. Ensure that Glean is completely in suspension in the spray tank before adding Avenge.

Heritage 5G (trifluralin)

Activity: 5% granules

Registered Uses: Crops	Date of Application	Recommended Rates of Product Sand/Sandy Loam 1-3% O.M.	4-8% O.M.
Wheat (spring, durum) for Brown Soil Zones	May	19 kg/ha (7.7 kg/ac)	22 kg/ha (9 kg/ac)
	June	16 kg/ha (6.5 kg/ac)	19 kg/ha (7.7 kg/ac)
	July	13 kg/ha (5.3 kg/ac)	16 kg/ha (6.5 kg/ac)
		2-8% O.M.	
	Sept.-Oct.[1]	11 kg/ha (4.5 kg/ac)	

Weeds Controlled: Fallow Year[2] - Green foxtail (wild millet), wild oats, Persian darnel, barnyard grass, wild buckwheat, cow cockle, lamb's-quarters, redroot pigweed, Russian thistle.

Crop Year - Green foxtail (wild millet) lamb's-quarters, wild oats[3], wild buckwheat[4].

[1] Do not fall apply Heritage to stubble when the current years crop was treated with another trifluralin product (eg. Treflan, Heritage, Rival or Triflurex). This includes application made in the spring or previous summer or fall. Do not fall apply Heritage to stubble or fallow when the previous years crop was an oilseed, barley, or pulse crop treated (in the spring or fall prior to seeding) with a deep incorporated trifluralin product (eg: Treflan, Rival or Triflurex).

[2] During the fallow year, susceptible weeds may not be fully controlled until after the second fallow operation has established a uniform layer of soil treated with Heritage.

[3] Control of wild oats in the crop year may be variable depending on wild oat population as well as soil and climatic conditions.

[4] Some wild buckwheat may escape the herbicidal action of Heritage but its growth will be retarded and result in limited competition to the wheat.

Application and Timing:

1. Do not apply to sandy soils with less than 1% organic matter. Application to severely eroded knolls is not recommended.
2. Do not apply to wet soils, soils in poor working condition, soils which contain more than 8% organic matter, or soils subject to prolonged periods of flooding.
3. Heritage may be applied to standing or pre-worked stubble, provided trash or green growth does not interfere with cultivation (prevent soil mixing).
4. An over-application caused by overlapping, improper applicator calibration or non- uniform application, may result in reduced crop stand, delayed development or reduced yields.
5. On coarse textured soils (sand, sandy loam) with 1-3% organic matter, application rates of Heritage applied to fallow in May, June and July should be reduced by 3 kg/ha (1.2 kg/ac) respectively. Research and field experience has shown that in these soils this reduction in application rate increases wheat tolerance. Refer to table above.

Incorporation:

Refer to Incorporation of Soil-Applied Herbicides section on page 5 for general incorporation procedures.

May-July - apply Heritage to the soil surface and incorporate immediately, in the same operation if possible. Do not delay incorporation more than 8 hours after application. Use a deep tillage cultivator, field cultivator or disc implement set to work 5-8 cm (2-3 in.) deep. A second incorporation at the same depth and at an angle to the first, should be done when weed growth requires it. After completing two fallow incorporations, additional operations with a rod weeder, shallow tillage, or fall 2,4-D application, may be required to control resistant weed growth.

September-October - apply Heritage after harvest until freeze-up, and incorporate immediately with a deep tillage cultivator, field cultivator or disc implement set to work 5-8 cm (2-3 in.) deep. Do not delay incorporation more than 8 hours after application. A second incorporation may be done in the fall, a minimum of three days later. Alternatively, to conserve trash cover throughout the winter, the second incorporation may be done in the spring, at the

time of seedbed preparation. The second incorporation should always be done at the same depth and at an angle to the first incorporation. Heritage should not be incorporated when the soil is crusted, lumpy, or too wet for good mixing action. Fall application is not recommended on soils where a lack of trash cover combined with the required incorporation could result in soil erosion.

Spring Tillage for Seedbed Preparation:

Seedbed preparation should be done using a field cultivator set to cut 5 cm (2 in.) deep when the soil is warm enough to promote good germination. Avoid transplanting weed seedlings; seed into a weed -free seedbed using a double disc drill or hoe drill set to seed 3-6 cm (1.2-2.4 in.) deep.

If a discer or air seeder is used for seeding, separate spring tillage may not be necessary. The discer or air seeder should be set to place seed 3-6 cm (1.2-2.4 in.) deep and the seedbed should be firmly packed or harrowed after seeding to promote good germination.

To reduce the risk of wheat injury, use quality seed and agronomic practices which will promote good growing conditions. **Note: Avoid deep seeding into cold soils.**

Mode of Action:

Heritage controls susceptible weeds by killing seedlings as they germinate. It does not control established weeds.

Precautions:

1. Prolonged drought conditions after a May-July application of Heritage to fallow may result in higher levels of trifluralin in the soil at the time of seeding. To reduce the possibility of crop injury in this situation, seed the crop 3-6 cm (1.2-2.4 in.) deep into a warm, moist seedbed.
2. Store in areas not exposed to high temperatures, prolonged direct sunlight, or moisture. Do not let product remain in the granular applicator under these conditions. After filling the granular applicator, close the lid immediately to avoid prolonged exposure to direct sunlight.
3. Applied and incorporated into the soil according to directions, Heritage will not injure the treated crop. However, over-application or improper incorporation as well as deep planting, disease, cold weather, excessive moisture, high salt concentration, or drought at the time of planting and early seedling growth, may weaken crop seedlings and increase the risk of injury from Heritage, resulting in reduced crop stand, delayed development or reduced yields.
4. There are no grazing restrictions.
5. Oats, canary seed and forage grasses should not be grown in rotation following a Heritage treated wheat crop.
6. Note: Speeds in excess of 8 km/h (5 mph) will result in excessive pulverization and trash reduction leaving fields susceptible to erosion. The maximum tillage depth recommended for Saskatchewan is 10 cm (4 in.). Application is not recommended on soils where a lack of trash cover combined with the required incorporation could result in soil erosion.
7. **Note:** Correct incorporation and seed placement are essential for the successful use of this product. Follow all label directions carefully.

Hoe-Grass (diclofop methyl)

Activity: 284 g active ingredient/litre

Registered Uses:
Crops
Wheat (spring, durum, winter), flax, canola, tame buckwheat, tame mustard, barley*, peas, lentils, fababeans, spring and fall rye, triticale, sunflowers (except Corona), seedling bromegrass**, creeping red fescue**, crested wheatgrass**, intermediate wheatgrass**, Russian wild ryegrass**, alfalfa**, red clover**, sweet clover**

Recommended Rates of Product
2.5-2.8 L/ha (1.0-1.13 L/ac)

At 2.5-2.8 L/ha one 20 litre container treats 8.0-7.1 ha (19.8-17.6 ac).

Weeds controlled: Wild oats, green and yellow foxtail, Persian darnel, barnyard grass, volunteer corn.

*Caution should be used when applying Hoe-Grass to Klages, Betzes and Norbert varieties of barley. There is a risk of crop injury under cool, humid conditions or if the crop has been subjected to drought or frost.
**Use in year of establishment only. DO NOT use Forage for Feed.

Application:

1. Apply in 100 L of water/ha (40 L/ac) at 275 kPa (40 psi).
2. Direct the spray pattern 45 degrees forward for best results. Adjust boom height to ensure uniform coverage.
3. Apply at least 4 days before applying broadleaf herbicides. Only Torch DS or Pardner, Glean or Lontrel can be tank-mixed with Hoe-Grass.

Timing:

Optimum weed control is achieved when wild oats, green foxtail and yellow foxtail, and barnyard grass are in the 1-4 leaf stage, and when Persian darnel is in the 1-3 leaf stage. For volunteer corn, apply when the corn is 15-25 cm (6-10 in.) in height.

For wild oats only, in the 4-5 leaf stage, apply Hoe-Grass at 2.8 L/ha. Note: Hoe-Grass effectiveness declines considerably after wild oats reach the 4-5 leaf stage, particularly if tillering has occurred.

Apply to barley in the 1-4 leaf stage and prior to tillering (usually not later than 21 days after emergence of the barley). Application beyond the 4-leaf stage or after tillering may result in damage.

Mode of Action:

Symptoms of Hoe-Grass appear in 2-3 days as a yellowing of the treated plants. Chlorosis progresses and death of the plants occurs in about two weeks.

Precautions:

1. DO NOT graze treated crop.
2. DO NOT apply if rainfall is expected within one hour.
3. DO NOT freeze.
4. Thoroughly clean sprayer of all other herbicide (i.e. 2,4-D, MCPA, dicamba, etc.) residues before applying Hoe-Grass.
5. Allow at least 4 days before using broadleaf herbicides. DO NOT apply broadleaf herbicides before using Hoe-Grass.
6. During periods of stress (i.e. very hot (28 C) and/or dry conditions or very low humidity) plants are not actively growing. Application of Hoe-Grass during these periods may result in significantly reduced weed control. Yellow blotches may appear on the crop leaves under these conditions.
7. Apply before tillering of grassy weeds.

Mixing:

1. Mix HOE-GRASS at 2.8 L/ha (1.13 L/ac) with PARDNER (280 g/L) at 1.0 L/ha (0.40 L/ac) or with TORCH DS at 625 mL/ha (253 mL/ac) to control grassy and broadleaved weeds in **wheat** and **barley** (except Betzes, Norbert, Klages) and TORCH DS at 625 mL/ha (253 mL/ac) in **flax**. Apply in 100 L of water/ha (40 L/ac) at a pressure of 275 kPa (40 psi). Apply when the weeds are in the 1-3 leaf stage and before the grassy weeds have tillered. Apply to flax when the crop is 5-10 cm (2-4 in.) tall. Do not apply to barley after the 4-leaf stage or more than 21 days after emergence. During periods of stress (i.e. very hot (28 C) and/or dry conditions or low humidity) plants are not

actively growing. Better control of grassy weeds will be achieved if HOE-GRASS is applied alone rather than as a tank-mix with TORCH DS or PARDNER under these conditions. Stinkweed and wild mustard must be sprayed at a very early stage for optimum control.

2. Mix HOE-GRASS at 2.8 L/ha (1.13 L/ac) with LONTREL at 1.0 L/ha (0.40 L/ac) to control grassy and certain broadleaf weeds and Canada thistle in **canola**. This tank mixture controls wild oats in the 1-4 leaf stage only.
3. Mix HOE-GRASS at 2.8 L/ha (1.13 L/ac) with GLEAN at 15 g/ha to control annual broadleaf weeds and wild oats only in **wheat** and **barley** (except Betzes, Norbert and Klages). This tank-mix does not control green or yellow foxtail, Persian darnel or barnyard grass. Careful attention must be paid to all precautions and recropping instructions on the Glean label. DO NOT apply this mixture by aircraft. Ensure Glean is in suspension before adding Hoe-Grass, continuous agitation is required. When using Glean in a tank-mix with Hoe-Grass the use of a surfactant is not required.
4. Mix HOE-GRASS at recommended rates with DECIS 5.0 EC insecticide to control annual grassy weeds and labelled insect pests at correct growth stages in wheat, barley (except Betzes, Norbert and Klages), flax, canola and mustard.

Hoe-Grass II (diclofop methyl and bromoxynil 23:8)

Activity: 310 g active ingredient/litre

Registered Uses:

Crops	Recommended Rate of Product
Wheat (spring, durum), flax, barley*	3.5 L/ha (1.40 L/ac)

At 3.5 L/ha one 20 litre container treats 5.7 ha (14.1 ac).

Weeds controlled: Wild oats, green and yellow foxtail, Persian darnel, barnyard grass, volunteer corn, wild and tartary buckwheat, lady's-thumb, green smartweed, kochia, common groundsel, knawel, night-flowering catchfly, cow cockle, wild mustard, scentless chamomile, stinkweed, lamb's-quarters, redroot pigweed, Russian thistle.

*Caution should be used when applying Hoe-Grass II to Klages, Betzes and Norbert varieties of barley. There is a risk of crop injury under cool, humid conditions of if the crop has been subjected to drought or frost.

Application:

1. Apply in 100 L of water/ha (40 L/ac) at 275 kPa (40 psi) and a ground speed of 6-8 km/h (3.8-5 mph).
2. Direct the spray pattern 45 degrees forward and adjust boom height to ensure optimum coverage. Use of 80 degree stainless steel flat fan nozzles is recommended.
3. DO NOT apply an additional herbicide within a minimum of 4 days after Hoe-Grass II application.

Timing:

Optimum weed control is obtained when grassy weeds are in the 1-4 leaf stage and when the broadleaf weeds are in the seedling to 4-leaf stage. For Persian darnel apply at the 1-3 leaf stage, for volunteer corn apply when corn is 15-25 cm (6-10 in.) in height, and for Russian thistle apply when height is 5 cm (2 in.) or less.

Stinkweed and wild mustard must be sprayed at a very early stage for optimum control.

Apply when flax is 5-10 cm (2-4 in.) tall, and when barley is in the 1-4 leaf stage, and prior to tillering. Application beyond the 4-leaf stage of barley or after tillering may result in crop damage.

Mode of Action:

Grassy weed control symptoms of Hoe-Grass II appear in 2-3 days as a yellowing of the treated plants. Chlorosis progresses and death of the plant occurs in about 2 weeks. Broadleaf weed control is by contact action. Thorough coverage of the weeds is required for optimum results.

Precautions:

1. DO NOT graze treated crop.
2. DO NOT apply if rainfall is expected within one hour.
3. DO NOT freeze.
4. Thoroughly clean sprayer of all other herbicide residues before applying Hoe-Grass II.
5. Allow an interval of 4 days before using other herbicides.
6. Application of Hoe-Grass II during hot, humid weather may result in temporary leaf scorch. Reduced grassy weed control may result if application is made when plants are not actively growing due to very hot and/or dry conditions.

Mixing:

1. HOE-GRASS II is registered in a tank-mix with MCPA amine to control volunteer canola and wild mustard in wheat and barley. However, due to inconsistent results and possible antagonism of grassy weed control this tank-mix is not recommended for use in Saskatchewan.
2. Mix HOE-GRASS II at the recommended rate with DECIS 5.0 EC insecticide for control of annual weeds and labelled insect pests at correct growth stages in wheat and barley.
3. DO NOT mix with any other pesticides (except as recommended), fertilizers or any other chemicals or additives as this will reduce effectiveness of Hoe-Grass II.

Kerb 50-W (propyzamide)

Activity: 50% wettable powder

Registered Uses:

Crops	Recommended Rates of Product
Established pastures	0.9 to 1.1 kg/ha (0.36-0.45 kg/ac)
Established alfalfa, bird's-foot trefoil	1.75 to 3.25 kg/ha (0.71-1.32 kg/ac)

At 0.9-1.1 kg/ha one 2 kg bag treats 2.2-1.8 ha (5.5-4.5 ac).
At 1.75-3.25 kg/ha one 2 kg bag treats 1.14-0.62 ha (2.8-1.5 ac).

Weeds controlled:

0.9 to 1.1 kg/ha - Foxtail barley
1.75 kg/ha - Annual grasses, volunteer cereals, wild oats
2.25-3.25 kg/ha - Above weeds plus quackgrass, orchardgrass, timothy, chickweed.

Application and Timing:

1. Premix Kerb 50-W in water and apply uniformly with flat fan nozzles at a minimum 220 L of water/ha (90 L/ac). Only 50 mesh or larger metal filters and nozzles screens should be used. Maintain good agitation during mixing and spraying.
2. Apply to established pastures, seeded at least 2 years prior to application, between October 1 and freeze-up. Use 0.9 kg/ha (0.36 kg/ac) on brown, dark brown, or gray-wooded soils, and 1.1 kg/ha (0.45 kg/ac) on thin black or black soils.
3. Apply to established alfalfa or bird's-foot trefoil, pure stands only, from late September to early November. Best results are obtained when soil temperature is low but above freezing and soil moisture is high.

Mode of Action:

Kerb 50-W acts through root absorption. Moisture carries Kerb 50-W into the root zone killing germinating seedlings when they begin to grow in the spring.

Precautions:

1. DO NOT harvest or graze within 90 days after application of 3.25 kg/ha (1.32 kg/ac), or 60 days after rates less than 3.25 kg/ha (1.32 kg/ac).
2. DO NOT plant other crops in Kerb treated soil for 9 months following application.
3. DO NOT apply on high organic soils; peat, muck, or thick black soils.
4. DO NOT use in seed grass stands.
5. DO NOT use on stands of timothy and fescue grass species.
6. Less tolerant grasses (Kentucky bluegrass) may experience a 10-20% stand reduction.

Mixing:

1. DO NOT tank-mix KERB 50-W with other herbicides, fertilizers or spray adjuvants.

Kilmor (dicamba + mecoprop + 2,4-D, 1:.8:3)

Activity: 500 g active ingredient/litre

Registered Uses:

Crops	Recommended Rates of Product
Wheat (spring, durum, winter), oats	0.85-1.1 L/ha (0.34-0.45 L/ac)
Barley	0.85 L/ha (0.34 L/ac)

At 0.85-1.1 L/ha one 10 litre container treats 11.8-9.1 ha (29.1-22.5 ac).

Weeds controlled at 0.85 L/ha: Wild buckwheat, lady's-thumb, smartweeds, Russian thistle, sow-thistle, corn spurry, knotweed, tame buckwheat, ragweeds, cocklebur, stinkweed, mustards (except dog mustard), pigweeds (prostrate, redroot), lamb's-quarters.

Weed controlled at 1.1 L/ha: Cow cockle, cleavers*, tartary buckwheat, flixweed, round- leaved mallow*, shepherd's-purse, Canada thistle top growth, field bindweed top growth.

*Suppression only

Application:

Use at least 100 L of water/ha (40 L/ac) to reduce the risk of crop injury.

Timing:

1. Spray at the 3-4 leaf stage of wheat and oats and the 3-leaf stage of barley. Treatment at the 3-leaf stage of the crop will usually combine maximum crop tolerance and weed susceptibility. Apply to winter wheat in spring before crop is 30 cm (12 in.) high.
2. Application at higher rates or after the 4-leaf stage or at low water volumes will usually result in stem bending and delayed maturity. Under conditions conducive to prolific tillering, the yield may also be reduced. Very severe yield losses due to sterility will result from treatment during the flag leaf to early heading stage.

Mode of Action:

Kilmor is a translocated herbicide which affects the roots of the plant. It is slower acting than most other broadleaf herbicides and death of the plants may take 2-3 weeks.

Precautions:

1. DO NOT use on cereals underseeded to legumes.
2. DO NOT freeze.
3. DO NOT apply if rainfall is expected within 4 hours.
4. DO NOT graze or harvest for feed prior to crop maturity.

Mixing:

DO NOT tank-mix KILMOR with other pesticides, fertilizers or spray adjuvants.

Lexone DF (metribuzin)

Activity: 75% dry flowable

Registered Uses:

Crops	Recommended Rates of Product
Wheat (spring, durum)	275 g/ha (111 g/ac)
Barley (except Klondike)	275-350 g/ha (111-142 g/ac)
Field Peas	280-375 g/ha (113-152 g/ac)
Fababeans	Lexone + Treflan (tank-mix only) (See Below)

At 275-350 g/ha one 2.5 kg container treats 9.1-7.1 ha (22.5-17.6 ac).

Weeds controlled: Hemp-nettle, chickweed, corn spurry, lamb's-quarters, stinkweed, volunteer canola, wild mustard, tartary buckwheat, ball mustard, smartweed, lady's-thumb. Wild buckwheat is not controlled. Use the higher rate for best residual control of chickweed and hemp-nettle or when weed infestation is heavy.

Application:

Premix Lexone with water in a clean pail before adding to spray tank. Apply in 100 L of water/ha (40 L/ac). Sprayer should be equipped with tips no finer than 6502, 8002 or LF2, nozzle screens no finer than 50 mesh and 50 mesh or larger line strainers. A pump of sufficient capacity to provide adequate volume through the by-pass and/or jet agitation system is essential. Crop must be seeded at least 5 cm (2 in.) deep.

Timing:

Apply when the cereal crop is in the 2-5 leaf stage. Early application of Lexone to peas (prior to 15 cm (6 in.) vine length) in 170 L of water/ha (68 L/ac) reduces risk of crop injury. Use the higher rate of application on peas where weed infestation is dense. Do not use on peas seeded less than 5 cm deep or in soils with less than 3% organic matter. Allow 4-5 days after cool, wet weather before application of Lexone to peas.

Mode of Action:

Lexone is a systemic herbicide and kills susceptible plants by inhibiting photosynthesis. Control may not be noticeable for 7-10 days after treatment.

Precautions:

1. Lexone may be applied when the crop is wet with dew but weed control may be reduced if there is rainfall within 6 hours after application.
2. Initial temporary (7-10 days) lightening in crop color and occasionally a slight reduction in crop height may occur especially if frost or abnormally high temperatures occur within 1-2 days of application. If frost occurs prior to application, allow 4-5 days for crop to recover before applying Lexone.
3. DO NOT use on crops underseeded to forages.
4. DO NOT graze or feed treated cereal crops to livestock within 30 days of application. DO NOT harvest for grain within 60 days of application. For peas do not harvest or feed within 70 days of application.
5. Continuous agitation is required during spraying. Do not let spray mixture stand without agitation or settling may occur.
6. Allow a 4-5 day interval between application of Lexone and wild oat herbicides.
7. DO NOT use on field peas grown under irrigation.

Mixing:

1. Mix LEXONE DF at the rate recommended for **barley** or **wheat** with MCPA amine at .84-1.1 L/ha (0.34-0.45 L/ac) when the crop is in the 3-5 leaf stage.
2. Mix LEXONE DF at 275 g/ha (111 g/ac) with BANVEL LH at 275 mL/ha (111 mL/ac) on **barley** and **wheat** when the crop is in the 2-3 leaf stage. Do not use on Klondike barley.
3. For broadleaf and grassy weed control in **fababeans** mix LEXONE DF at 400-550 g/ha (162-223 g/ac) with TREFLAN at 2.0-2.6 L/ha (0.81-1.10 L/ac) for fall application. For spring application mix LEXONE DF at 350-550 g/ha (142-223 g/ac) with TREFLAN at 1.5-2.0 L/ha (0.61-0.81 L/ac) in 100 L water/ha (40 L/ac) and incorporate immediately following recommendations for TREFLAN incorporation.

Lontrel (clopyralid)*

Activity: 200 g active ingredient/litre

Registered Uses:

Crops	Recommended Rates of Product
Canola	1.0-1.5 L/ha (0.40-0.61 L/ac)

At 1.0-1.5 L/ha one 4 litre container treats 4.0-2.7 ha (9.9-6.6 ac).

Weeds controlled:
1.0 L/ha - scentless chamomile, wild buckwheat, Canada thistle, top growth of perennial sow -thistle.
1.5 L/ha - for extended Canada thistle control into the following year.

Application:

Apply in a minimum of 100-200 L of water/ha (40-80 L/ac), by ground equipment only, at pressures of 200-275 kPa (30-40 psi).

Timing:

Apply at the 3-6 leaf stage of canola, when weeds are actively growing. Canada thistle plants should be between 10 cm (4 in.) tall and the early bud stage.

Mode of Action:

Clopyralid is a growth regulator type of herbicide, which is primarily absorbed through the foliage and is translocated to all parts of the plants.

Precautions:

1. DO NOT apply Lontrel herbicide to, or let it come into contact with, sunflowers, legumes (including lentils and peas), fruits or vegetable crops, flowers or other desirable broadleaf plants.
2. If the sprayer has been used previously to apply 2,4-D, MCPA or similar herbicides it is imperative that the spray equipment be thoroughly cleaned before Lontrel herbicide is mixed in the spray tank. Trace contamination of these herbicides will result in damage to canola.
3. DO NOT apply by air.
4. Field previously treated with Lontrel can be seeded to wheat, oats, barley, rye, flax, rapeseed or summerfallowed. Do not seed to crops other than those listed the year following treatment. There are no cropping restrictions thereafter.
5. DO NOT freeze.
6. DO NOT apply if rainfall is expected within 6 hours.

Sprayer Clean-up:

1. Drain and flush the spray system with clean water, in an area well away from sensitive plants.
2. Fill the system with a 1:100 mixture of household ammonia and water; circulate the mixture through the system for five minutes, then let stand for 24 hours.
3. Drain the system and flush twice with clean water.

Mixing:

Use only registered tank-mix combinations.

*This product has a temporary registration. Additional technical information is required in relation to its use. Be advised that the current label may be revised. Directions for use and cautionary statements should be carefully followed.

Lorox L (linuron) + MCPA (1:2) - Tank-Mix

Activity: Lorox L 480 g active ingredient/litre
MCPA amine 500 g active ingredient/litre
MCPA K 400 g active ingredient/litre
(potassium salt)

Registered Uses:

Crops	Recommended Rates of Product
Wheat (spring, durum), oats, barley	425-550 mL/ha (172-223 mL/ac) + 1.1 L/ha (0.45 L/ac) MCPA amine
Wheat (spring, durum), barley	425-550 mL/ha (172-223 mL/ac) + 1.0-1.4 L/ha (0.40-0.57 L/ac) MCPA K

At 425-550 mL/ha one 10 litre container treats 23.5-18.2 ha (58.1-44.9 ac).

Weeds Controlled: Wild buckwheat, tartary buckwheat, green smartweed, cow cockle, hemp- nettle, corn spurry, chickweed, redroot pigweed, prostrate pigweed, Canada thistle top growth. All weeds controlled by 1.1 L/ha MCPA[1] (0.45 L/ac).

Application:

1. Apply in 100 L of water/ha (40 L/ac).
2. Use the lower rates when growing conditions and rainfall are above average.
3. When using a flowable formulation certain precautions and sprayer adjustments must be made to ensure that it is applied correctly. Be sure that the sprayer is equipped with 50 mesh line strainers and screens. Stainless steel or hardened stainless nozzles are recommended. Also, pumps must be of sufficient capacity for adequate agitation through the by-pass or jet agitator which should terminate in the bottom of the tank.

Note: a jet agitator should never be put on the end of the by-pass line because a high back pressure develops on the pump and system when the booms are shut off.

Timing:

Apply when the weeds are in the 1-4 leaf stage. Hemp-nettle must be treated before the full 4-leaf stage. Apply when the cereal is in the 2-4 leaf stage.

Application after the 4-leaf stage of cereals can result in severe crop damage especially on sandy soils under good moisture conditions.

Mode of Action:

Linuron is a systemic herbicide which is absorbed through both the foliage and the root system of the plant. Once in the plant, its mode of action is to strongly inhibit photosynthesis.

Outward appearance of affected plants is chlorosis (yellowing), stunting, and finally death which occurs in 10-14 days after treatment.

Precautions:

1. DO NOT use when crops are under drought stress.
2. DO NOT use on crops underseeded to forage crops.
3. DO NOT graze or feed green plants to livestock.
4. DO NOT re-treat field with a second application of linuron during the same crop year as injury to the crop may result.
5. DO NOT freeze liquid formulations.
6. DO NOT apply if rain is expected within one hour.

Mixing:

1. When mixing LOROX L with MCPA, the following is recommended:
   (a) Half fill the spray tank with water.
   (b) With hydraulic by-pass or mechanical agitator operating, slowly pour Lorox L into the tank.
   (c) Add MCPA.
   (d) Fill tank to the required water level and spray. Continuous agitation is required.

   Note: Do not leave Lorox L in the spray tank overnight or vigorous agitation with a paddle will be required to resuspend the chemical.
2. Mix LOROX L at 425 mL/ha (172 mL/ac) with TARGET at 1.0-1.5 L/ha (0.40-0.61 L/ac) to control broadleaf weeds in wheat, barley and oats.

[1]amine formulation. See page 72.

Mataven, Mataven L (flamprop-methyl)

Activity: Mataven 84 g active ingredient/litre
Mataven L 52.5 g active ingredient/litre

Registered Uses:

Crops	Recommended Rates of Product
Wheat (durum, winter, spring except Selkirk), triticale, canary seed	5.0 L/ha (2.0 L/ac)
Sunflowers	5.0-6.5 L/ha (2.0-2.6 L/ac). (Use the high rate of application for banding)
Forage Crops Grown for Seed In year of Seeding: Alfalfa, sainfoin, red clover, bird's-foot trefoil, cicer milkvetch	5.0 L/ha (2.0 L/ac)
Bromegrass, meadow fescue, creeping red fescue, Russian wild ryegrass, intermediate wheatgrass, crested wheatgrass	5.0-7.5 L/ha (2.0-3.0 L/ac). (Use the higher rate when grown without a companion crop)

At 5.0 L/ha one 10 litre container treats 2.0 ha (4.9 ac).

Weeds controlled: Wild oats

Application:

Apply in 100 L of water/ha (40 L/ac) at a pressure of 300 kPa (44 psi). Direct the spray pattern 45 degrees forward and adjust boom height to ensure uniform coverage. Optimum results can be expected when applied with flat fan nozzles. DO NOT use flood jet or hollow cone nozzles.

Timing:

Apply when the majority of the wild oats are in the 3-6 leaf stage. Treatment at the 3-4 leaf stage will give the best combination of wild oat control and crop yield response. Do not apply to crop that is past the six leaf stage. Wild oats with less than three leaves will not be controlled.

Mode of Action:

Mataven kills most wild oat plants. Those that survive will be stunted and should not compete with the crop.

Precautions:

1. Thoroughly flush the spray tank and lines with water, before and after using Mataven formulations.
2. Allow an interval of 4 days between the use of Mataven formulations and application of MCPA, Torch DS, Pardner, Torch DS/Pardner + MCPA, Buctril M, Sabre or Bromox 720 M and an interval of seven days between the application of Mataven and 2,4-D or Banvel.
3. DO NOT graze treated areas.
4. DO NOT store below freezing.
5. DO NOT apply if rainfall if expected within 2 hours.

Mixing:

1. Mix MATAVEN or MATAVEN L at 5.0 L/ha (2.0 L/ac) with GLEAN at recommended rates for control of wild oats and broadleaf weeds in spring and durum wheat. Do not apply by air. Add Glean to the spray tank first, followed by Mataven or Mataven L. Do not add a surfactant. Maintain continuous agitation while filling and spraying. Apply when broadleaf weeds are small and actively growing and when wild oats are in the 3-6 leaf stage.
2. Do not mix with any other pesticides, fertilizers or spray adjuvants.

Mecoturf (mecoprop)

Activity: 150 g active ingredient/litre

Registered Uses:

Crops	Recommended Rates of Product
Wheat (spring, durum), oats, barley	5.5-7.0 L/ha (2.22-2.83 L/ac)

Weeds Controlled: Chickweed, corn spurry, cleavers, plantain, volunteer clover and top growth of Canada thistle.

Application:

Apply in 200 L of water/ha (80 L/ac).

Timing:

For best results apply when the weeds are in the 2-4 leaf stage. Mecoprop can be applied safely to cereals from the 3-leaf stage to just before the flag-leaf stage.

Mode of Action:

Similar to 2,4-D and MCPA.

Precautions:

1. DO NOT feed treated fodder to livestock.
2. DO NOT use on cereals underseeded to legumes.
3. Rain shortly after application will reduce effectiveness.
4. DO NOT freeze.

Mixing:

DO NOT mix MECOTURF with other pesticides, fertilizers or spray adjuvants.

Pardner (bromoxynil)

Activity: 280 g active ingredient/litre

Registered Uses:

Crops	Recommended Rate of Product
Wheat (spring, durum, winter), oats, barley, triticale, fall rye, seedling grasses (bromegrass, timothy, slender wheatgrass, creeping red fescue, reed canarygrass, crested wheatgrass, orchardgrass, tall wheatgrass, inter- mediate wheatgrass, Russian wild ryegrass and meadow fescue)	1.0-1.2 L/ha (0.40-0.50 L/ac)
Canary seed	1.0 L/ha (0.40 L/ac)

At 1.0-1.2 L/ha two 8 litre containers treat 16.0-13.3 ha (39.5-33.0 ac).

Weeds controlled: Green smartweed, lady's-thumb, wild mustard, kochia, cow cockle (seedling to 4-leaf stage), lamb's-quarters, stinkweed, Russian thistle (seedling to 5 cm (2 in.) high), wild buckwheat, tartary buckwheat, common buckwheat, common groundsel, cocklebur, wormseed mustard, bluebur, American nightshade.

Application:
Apply bromoxynil in 100 L of water/ha (40 L/ac) at a pressure of 275 kPa (40 psi).

Timing:

1. Bromoxynil can be safely applied in the spring to cereals from the 2-leaf stage until the appearance of the flag leaf and to canary seed in the 3-5 leaf stage. Best results are obtained from applications made at the early leaf stages.
2. Apply when seedling grasses are in 2-4 leaf stage. Apply to grasses in the year of establishment only, not underseeded to a legume.
3. Apply when broadleaf weeds are in the 1-4 leaf stage. Stinkweed and wild mustard must be sprayed at a very early stage for optimum control.

Mode of Action:
Bromoxynil is a contact herbicide. Therefore, thorough coverage of the weeds is required for good control.

Precautions:

1. DO NOT apply bromoxynil or mixtures containing bromoxynil during hot, humid weather as this may result in temporary leaf scorch.
2. DO NOT apply if rainfall is expected within 30 minutes.
3. DO NOT freeze.
4. There are no grazing restrictions.

Mixing:

1. Mix PARDNER at 1.0 L/ha (0.40 L/ac) with AVENGE 200-C at 3.5-4.25 L/ha (1.40-1.70 L/ac) to control wild oats and broadleaved weeds in barley and those varieties of **wheat** and **fall rye** registered for AVENGE 200-C. Apply in 100 L of water/ha (40 L/ac) when the wild oats are in the 3-5 leaf stage. Add the broadleaf herbicide at start of filling then fill tank to 3/4 full and add AVENGE 200-C. Top off spray tank with remaining water.
2. Mix PARDNER at 1.0 L/ha (0.40 L/ac) with MCPA at 0.56-0.84 L/ha (0.23-0.34 L/ac) to control a wide range of broadleaf weeds in **wheat**, **winter wheat**, **oats** and **barley**. To control hemp-nettle mix with MCPA at 1.1 L/ha (0.45 L/ac).
3. Mix PARDNER at 1.0 L/ha (0.40 L/ac) with:
   a) 2,4-D Amine at 0.56-0.84 L/ha (0.23-0.34 L/ac) or
   b) 2,4-D LV ester (600 g active ingredient/L) at 0.47-0.70 L/ha (0.19-0.28 L/ac) to control a wide range of broadleaf weeds in **wheat** and **barley**. DO NOT apply the tank-mix with 2,4-D prior to the 4-leaf stage of the crop.
4. Mix PARDNER at 1.0 L/ha (0.40 L/ac) with HOE-GRASS at 2.8 L/ha (1.13 L/ac) to control grassy and broadleaved weeds in **spring wheat** and **barley** (except Betzes, Norbert, Klages). Apply in 100 L water/ha (40 L/ac) at a pressure of 275 kPa (40 psi). Apply when the weeds are in the 1-3 leaf stage and before the grassy weeds have tillered. Do not apply to barley after the 4-leaf stage or more than 21 days after crop emergence. During periods of stress (i.e. very hot (28 C) and/or dry conditions or low humidity) plants are not actively growing. Better control of grassy weeds will be achieved if HOE-GRASS is applied alone rather than as a tank-mix with PARDNER under these conditions.
5. Mix PARDNER at 1.0 L/ha (0.40 L/ac) with MCPA at 0.56 L/ha (0.23 L/ac) and TCA to control broadleaf weeds and green foxtail in **barley** and **oats**. Refer to page 60 for recommended rates of application for TCA formulations. Apply in 100-150 L water/ha (40-60 L/ac) when the crop is in the 2-4 leaf stage. Add MCPA to the tank first then Pardner, and finally TCA. Keep well agitated during mixing and application. This treatment may cause leaf burn and retarded crop growth, particularly under adverse growing conditions.

Poast (sethoxydim)

Activity: 184 g active ingredient/litre

Registered Uses:
Crops
Canola (including triazine tolerant canola), flax, peas

Recommended Rates of Product and Weeds Controlled:
At 0.8 L/ha (0.32 L/ac): Green and yellow foxtail (wild millet), barnyard grass, volunteer corn, proso millet, fall panicum, witchgrass, Persian darnel; for extremely heavy infestations use 1 L/ha (0.40 L/ac) rate.
At 1.4 L/ha (0.57 L/ac): All of the above plus wild oats; for extremely heavy infestations of wild oats, use 1.6 L/ha rate (0.65 L/ac).
At 1.4 L/ha (0.57 L/ac) plus BASF Ammonium Sulphate at 4 L/ha (1.6 L/ac): All of the above plus volunteer wheat, volunteer oats and volunteer barley (Late application and/or poor growing conditions may result in reduced control of annual grasses).
*At 1.6 L/ha (0.65 L/ac): All of the above plus volunteer wheat, volunteer oats and volunteer barley.
*At 1.9 L/ha (0.77 L/ac): All of the above plus extremely heavy infestations of volunteer barley.
**At 2.7 L/ha (1.08 L/ac) plus BASF Ammonium Sulphate at 4 L/ha (1.6 L/ac): All of the above plus quack grass top growth.
***At 4.4 L/ha (1.76 L/ac): All of the above plus quack grass top growth.

At 0.8-1.9 L/ha one 7 litre container treats 8.75-3.7 ha (21.6-9.1 ac). BASF Ammonium Sulphate available as a Power Pack. 1 case of Poast with 1 Power Pack will do 12.8 acres at the quack grass rate. 1 case of Poast with 2 Power Packs will do 24.7 acres at the Volunteer Cereals rate.

* For use without the Power Pack (BASF Ammonium Sulfate).
** For Flax Only.
*** Not for use on Canola.

Application:

1. Apply post-emergence in 50-100 L/ha (20-40 L/ac) of water at a minimum 240 kPa (35 psi) pressure with 0.5 to 1.0 L/ha (0.2-0.4 L/ac) of Assist for annual grasses and 2.0 L/ha (0.81 L/ac) of Assist for quack grass. In applications to dense weed infestations or to dense crop canopies, use 100 to 200 L/ha (40-80 L/ac) of water at pressures of 275 to 425 kPa (40-60 psi) with 1.0-2.0 L/ha (0.4-0.8 L/ac) of Assist for annual grasses and 4.0 L/ha (1.6 L/ac) of Assist for quack grass.
2. Use 80 degree stainless steel flat fan nozzles angled forward at 45 degrees to ensure better coverage.
3. Poast may be applied by air in 25-50 L/ha (10-20 L/ac) of water in pressures up to 200 kPa (30 psi). Care should be taken to prevent drift to nearby sensitive cereal and other grass crops.

Timing:

1. Poast is tolerated by all stages of the crop.
2. Apply Poast when wild oats, foxtails, volunteer cereals and other annual grasses are in the 1-6 leaf stage. Most effective control is at the 2-5 leaf stage of the grasses, when the crop is still small enough to permit thorough coverage to the grasses. Quack grass should be sprayed in the 1-3 leaf stage.

Mode of Action:

Poast is a contact and systemic herbicide. Uptake is primarily through the leaves and thorough coverage of the foliage is important for consistent grass control. Susceptible annual grasses stop growing and slowly turn brown. Complete control takes 7-21 days. Top growth control of quack grass, in crop, can be expected for at least 6 to 8 weeks. Some underground buds dormant at the time of application may regrow later in the season. Crop competition will help keep regrowth to a minimum until harvest.

Precautions:

1. DO NOT apply if rainfall is expected with 1 hour.
2. Allow 4 days between applications of Poast and any other pesticide.
3. DO NOT graze treated fields or harvest for feed prior to crop maturity.
4. When grasses are stressed due to drought, flooding or prolonged cool temperatures (15 C or less), control can be reduced or delayed.
5. Avoid causing spray drift to susceptible cereal or grass crops.

6. DO NOT spray quack grass rates by air.
7. DO NOT apply Poast plus broadleaf tank mixes by air.
8. DO NOT apply Poast plus BASF Ammonium Sulphate by air.
9. DO NOT use BASF Ammonium Sulphate with any broadleaf weed herbicide and POAST tank mixes.
10. Apply Poast in a thoroughly clean sprayer.
11. Immediately after use, thoroughly clean the sprayer by flushing the system with water containing detergent. (A Poast plus Assist mix will be satisfactorily cleaned by using household ammonia. Other precautions should be used, depending on broadleaf compound used).
12. BASF Ammonium Sulphate can be corrosive to galvanized sprayer parts, therefore thorough cleaning after use is essential.
13. All research work was done with BASF Ammonium Sulphate. BASF Ammonium Sulphate is a liquid form of technical grade 21-0-0-24 and should not be confused with the prelled fertilizer grade. The fertilizer grade may not give the same quality of results as can be expected with the technical grade.

Mixing:

When mixing POAST the following is recommended. Half fill the spray tank with water and start continuous agitation. Agitation should be running during the entire mixing procedure. Add the broadleaf herbicide or BASF Ammonium Sulphate if required, add the correct amount of Poast, add the correct amount of Assist Oil Concentrate. Fill tank to required water level and spray. Continuous agitation is required. Avoid allowing spray mixture to sit overnight.

The following mixtures may result in some crop injury, delayed maturity and/or some reduced grass control. **DO NOT use BASF Ammonium Sulphate with any broadleaf weed herbicide and Poast tank mixes.**

1. Mix POAST at the required rate (maximum 1.9 L/ha) with:
   (a) BUCTRIL-M (560) at 1.0 L/ha (0.40 L/ac)
   or
   (b) SABRE at 0.78 L/ha (0.32 L/ac) to control grassy and broadleaf weeds in **flax**. Apply in a minimum 100 L of water/ha (40 L/ac) when grass weeds are in the 2-5 leaf stage and flax is 5-10 cm (2-4 in.) tall. Rates of Assist Oil Concentrate greater than 1.0 L/ha (0.4 L/ac) may result in increased flax injury.
2. Mix POAST at the required rate (maximum 1.9 L/ha) with MCPA (amine or ester) up to 1.1 L/ha (0.45 L/ac) to control grassy and broadleaf weeds in **flax**. Apply after the **flax** is 5 cm (2 in.) tall and before bud formation.
3. Mix POAST at the required rate (maximum 1.9 L/ha) with BLADEX TTC at 3.0 L/ha (1.21 L/ac) to control grassy weeds and broadleaf weeds in **triazine tolerant canola**. Apply when
   grassy weeds are in the 1-6 leaf stage and broadleaf weeds are in the 1-4 leaf stage, no later than the 4-leaf stage of the crop.
4. Mix POAST at the required rate (maximum 1.9 L/ha) with LONTREL at 1.0-1.5 L/ha (0.4- 0.61 L/ac) to control grassy weeds and some broadleaf weeds in **canola**. Apply when grassy weeds are in the 2-5 leaf stage and Canada thistle is greater than 10 cm (4 in.) tall. The canola should be in the 3-6 leaf stage.

Princep Nine-T, Simazine 80W (simazine)

Activity: Princep Nine-T 90% water dispersible granule
Simazine 80W 80% wettable powder

Registered Uses:

Crops	Recommended Rates of Product
Established alfalfa, bird's-foot trefoil	1.1 kg/ha (0.45 kg/ac) Princep Nine-T
Established bird's-foot trefoil	1.5 kg/ha (0.61 kg/ac) Simazine 80W

At 1.1 kg/ha one 1.5 kg container treats 1.4 ha (3.5 ac).
At 1.5 kg/ha one 2.0 kg container treats 1.3 ha (3.3 ac).

Weeds controlled: Lady's-thumb, lamb's-quarters, purslane, ragweed, volunteer clover, wild buckwheat, smartweed, barnyard grass, wild oats, green foxtail.

Application:

1. Gentle agitation is required during mixing and spraying of the water dispersible granule. Use nozzle screens of 50 mesh size or larger. After any break in the spray application, agitate thoroughly.
2. Apply in 300 litres of water/ha (120 L/ac).

Timing:

Apply in fall from September to freeze-up.

Mode of Action:

Princep acts through the roots of germinating weeds and inhibits photosynthesis.

Precautions:

1. DO NOT graze for 30 days or harvest for 60 days.
2. DO NOT plant any other crop into treated area, soil residues may persist for 2 or more years.
3. DO NOT overlap application.
4. DO NOT apply to the same field for more than 3 consecutive years.
5. DO NOT apply gramoxone within one year after the application.

Mixing:

DO NOT tank-mix PRINCEP NINE-T or SIMAZINE 80W with any other herbicides, fertilizers or spray adjuvants.

Rival EC, 10 G (trifluralin)

Activity: Rival EC 500 g active ingredient/litre
Rival 10G 10% granules

Registered Uses:

Crops	Recommended Rates of Product		
	Fall Granular	**Fall Liquid**	**Spring Liquid**
Canola, sunflowers, peas, mustard	11-14 kg/ha (4.5-5.7 kg/ac)	2.2-2.8 L/ha (0.91-1.13 L/ac)	1.6-2.2 L/ha (0.65-0.91 L/ac)
Fababeans	Not Recommended	2.2-2.8 L/ha (0.91-1.13 L/ac)	1.6-2.2 L/ha (0.65-0.91 L/ac)
Flax, lentils	11-14 kg/ha (4.5-5.7 kg/ac)	2.2-2.8 L/ha (0.91-1.13 L/ac)	Not Recommended
Wheat (spring, durum)	Not Recommended	Not Recommended	1.2-1.6 L/ha[1] (0.49-0.65 L/ac)
Barley	8.5-14 kg/ha[2] (3.4-5.7 kg/ac)	Not Recommended	1.2-1.6 L/ha[1] (0.49-0.65 L/ac)

Summer Application:
Flax and canola only — 3.4 L/ha (1.38 L/ac), 14.0-17.0 kg/ha (5.7-6.9 kg/ac)

At 11-14 kg/ha one 22.7 kg bag treats 2.1-1.6 ha (5.1-4.0 ac).
At 1.6-2.2 L/ha one 9 litre container treats 5.6-4.1 ha (13.9-10.1 ac).

Weeds Controlled: Wild oats, green and yellow foxtail (wild millet), barnyard grass, wild buckwheat, cow cockle, redroot pigweed, lamb's-quarters, Russian thistle, chickweed, purslane, knotweed, Persian darnel.

[1]Rates recommended for barley and wheat will control green and yellow foxtail (wild millet) only.

[2]Use 8.5 kg/ha (3.4 kg/ac) in soils with 2-4% organic matter. Use 11.0 kg/ha (4.5 kg/ac) in soils with 4-6% organic matter. Use 14 kg/ha (5.7 kg/ac) in soils with 6-10% organic matter (except sandy and sandy loam soils).

Application:

1. Apply Rival EC in a minimum of 100 L of water/ha (40 L/ac) at a pressure of 200 to 275 kPa (30-40 psi). Use ground equipment only.
2. For sandy or sandy loam soils with less than 6% organic matter, use the lower rate. All medium to heavy soils (loams and clays) with 6-15% organic matter, use higher rates depending on extent of wild oat infestations.
3. Do not apply to soils which contain more than 15% organic matter, such as peat or muck soils, wet soils that are subject to excessive flooding or soils in poor working condition.
4. All weeds should be eliminated through discing or cultivation before applying Rival. For application to stubble and trashy soils, thoroughly disc soils to ensure crop residues and trash have been mixed into the soil to a maximum depth of 10 cm (4 in.).
5. Do not fall apply Rival to soils subject to erosion by wind, water or other factors. Fall application to summerfallow with low trash cover or light textured soils may predispose field to erosion and is not recommended.

Timing:

Spring - apply and incorporate immediately, in the same operation if possible. Do not delay incorporation more than 8 hours after application. The second incorporation may be done at the time of seedbed preparation provided it is done at the recommended depth.

Summer - apply to summerfallow between June and September 1 and incorporate immediately, in the same operation if possible. Do not delay incorporation more than 8 hours after application. All further incorporations may be done at any time during the fallow season. Shallow till in spring after the soil has warmed.

Fall - apply between September 1 and soil freeze-up. Incorporate immediately, in the same operation if possible. Do not delay incorporation more than 8 hours after application. The second

incorporation may be done in the fall or spring at the time of seedbed preparation. For Rival 10 G, delay second incorporation for 5 days after first incorporation to allow greater release of product and more effective weed control. A shallow tillage in spring prior to seeding is required if second incorporation is done in the fall.

Incorporation:

For Oilseed and Pulse Crops

Incorporate with disc implements or cultivators only. A tandem disc is recommended for the first incorporation. Do not delay first incorporation more than 8 hours after application. The first incorporation should be in the same direction as application with the second incorporation at right angles to the first. For summer or fall applications, a shallow tillage is required in the spring prior to seeding if both incorporations are done in the fall.

Incorporate to a depth of 8-10 cm (3-4 in.). Disc implements should be operated at 7-10 km/h (4.2-6.2 mph) and cultivators at 8-10 km/h (5-6.2 mph). Deep tillage cultivators, chisel plows, rod weeders, harrows or hoe-drills are not recommended.

Special Instructions for Flax and Lentils:

1. Both incorporations should be done in summer or fall before seeding in the spring. For lentils, apply Rival 10 G or EC in fall only if crop is to be seeded the following spring.
2. A shallow tillage and packing of seedbed in the spring is recommended to ensure a firm seedbed and maintain a constant planting depth.
3. Seed to a depth of 2-4 cm (.8-1.6 in.) into a moist seedbed when soil temperatures are warm (usually after mid-May). Environmental factors which delay crop germination and emergence will increase the risk of damage resulting in a delay in crop maturity and/or reduced yields.

Directions for fall application of Rival 10 G in barley:

1. Do not use barley rates of application in other registered crops.
2. Do not apply Rival 10 G for barley on land treated with Rival, Treflan, Heritage or Triflurex since June 1 of the previous year.
3. Use varied recommended rates for soils of organic matter up to 10%. Do not apply to soils with more than 10% organic matter or less than 2% organic matter.
4. Application to severely eroded knolls may result in reduced crop stand.
5. Initial incorporation must be within 8 hours of application to a depth of 8-10 cm (3- 4 in.). Second incorporation should also be done in fall at right angles to first, and be delayed for 5 days for maximum weed control effectiveness.
6. Do not seed when soil conditions are cold. Seeding should be done with drills into warm, moist seedbeds. If air seeder or discers are used, avoid variable seeding depth and ensure a firm seedbed by packing after seeding.

For Cereals:

Spring application of Rival in wheat and barley will control green foxtail (wild millet) only. Seed crop in a well prepared seedbed to a depth of 5-8 cm (2-3 in.). Apply Rival EC immediately after seeding and before crop emerges to trash free soil. Two shallow incorporations of 2-4 cm (.8-1.6 in.) with tyne or diamond harrows must be done within 8 hours of application at speeds of at least 8 km/h (5.6 mph) and at right angles to each other. First incorporation should be done in the same direction as application.

Mode of Action:

Rival controls susceptible weeds through the roots as they germinate. It does not control susceptible weeds that have emerged through the soil at the time of application.

Precautions:

1. Fall application of Rival is not recommended to soils subject to erosion by wind, water or other factors, to summerfallow with low trash cover, or to a light textured soil which may predispose the field to erosion.
2. Do not apply to peat or muck soils, wet soils subject to excessive flooding, soils with more than 15% organic matter, or soils in poor working condition.
3. Highly sensitive crops such as tame oats, canary seed, sugar beets and forage grasses should not be grown in rotation the year after Rival application.
4. A risk of damage to treated crops from Rival may result if factors such a deep planting, excessive moisture, cold temperatures, seedling disease, poor soil fertility, drought or saline soils weaken crop emergence. A delay in crop maturity and/or reduced yields may result.
5. Crop injury to wheat may result in the second year of a crop rotation following dry soil conditions during the first crop year after Rival 10 G is used. To reduce injury to wheat, seed the crop shallow when a warm, moist seedbed is present.

6. Avoid concentrating Rival 10 G in narrow bands. Use properly calibrated granular application for uniform application to soil surface.
7. Injury to wheat and barley may occur if seeded into a deeply incorporated layer of Rival.
8. If Rival EC is frozen, bring the contents to 15 C for 24 hours and shake well before using.

Mixing:

1. Mix RIVAL EC at 1.2 L/ha (0.49 L/ac) on light and medium soils and at 1.6 L/ha (0.65 L/ac) on heavy soils with AVADEX BW at 3.5 L/ha (1.40 L/ac) in **wheat** and 4.25 L/ha (1.70 L/ac) in **barley** for wild oat and green foxtail control. Apply immediately after seeding and before crop emerges. Double incorporate at right angles to a depth of 2-4 cm (.8-1.6 in.) within 8 hours of application. Incorporation must be above the depth of seed placement.
2. Mix RIVAL at 1.6-2.2 L/ha (0.65-0.91 L/ac) for spring application in oilseed and special crops and at 1.2-1.6 L/ha (0.49-0.65 L/ac) in wheat and barley with liquid nitrogen fertilizer (eg. 28-0-0). For wheat and barley, Rival and liquid nitrogen fertilizer may also be mixed with Avadex BW. Follow incorporation instructions, application timing and cautions for normal Rival application, as per registered crop. To test Rival's compatibility with liquid fertilizer add 500 mL of liquid fertilizer and 10 mL of Rival to a container and shake well. If Rival remains in suspension for 5 minutes or longer, the two are compatible. If Rival settles out, but can be resuspended quickly by shaking, the mixture may be used, but constant and vigorous agitation will be required before and during application.

Note: Speeds in excess of 8 km/h (5 mph) will result in excessive pulverization and trash reduction leaving fields susceptible to erosion. The maximum recommended tillage depth for Saskatchewan is 10 cm (4 in.). Fall application is not recommended where a lack of trash cover combined with the required incorporation could result in soil erosion.

Herbicide Recommendations
For
Cereal, Oilseed and Pulse Crops

How To Use This Chart:

1. **Locate the weed(s) you wish to control.**
2. **Read down the weed(s) column(s) to see which chemicals will give control.**
3. **Check the crops section to see which of the herbicides can be used in the crop concerned.**
4. **Consult the appropriate page for information on use of specific chemicals.**

Crops and Weeds

Products

	Products	See Page	Wheat (spring, durum)	Winter Wheat	Barley	Oats	Rye, fall	Flax	Canola	Mustard	Sunflowers	Peas	Lentils	Canary Seed	Fababeans	Triazine Tolerant Canola	Tame Buckwheat
			Crops														
—	**AFOLAN +MCPA**	11	•		•	•											
—	**ASULOX F**	12						•									
◈	AVADEX BW SPRING FALL	13	:		:			:	:	:		·					
◈	AVENGE	16	•	•	•		•							•			
—	**BANVEL**	18	•	•	•	•								•			
⚠	**BANVEL + 2,4D or MCPA Mix**	18	•	•	•	•								•[i]			
⚠	BASAGRAN	20						•				•			•		
—	BASFAPON/DOWPON	21						•	•			•					•
—	**BENAZOLIN**	22							•							•	
☠	**BLADEX TTC**	23															
—	BLAGAL	24	•		•	•											
◈	BUCTRIL M	25	•	•	•	•	•	•						•			
—	**MECOTURF**	45	•		•	•											
⚠	**DYVEL**	26	•	•	•	•											
⚠	EMBUTOX/BUTYRIC 400/COBUTOX	27	•		•	•											
⚠	EPTAM-8E	28									•						
◈	**ESTAPROP**	29	•	•	•												
—	**FORTRESS**	30	•		•			•	•	•							
⚠	GLEAN	32	•	•	•	•											
—	HERITAGE	34	•														
—	**HOE-GRASS**	36	•	•	•		•	•	•	•	•	•	•		•		•
◈	**HOE-GRASS II**	38	•		•			•									
⚠	KILMOR	40	•	•	•	•											
—	LEXONE	41	•		•							•			•[h]		
—	**LONTREL**	42							•								
—	**LOROX + MCPA**	43	•		•	•											
⚠	MATAVEN/MATAVEN L	44	•	•							•			•			
—	MCPA[1]	71	•	•	•	•	•	•				•[d]					
◈	**PARDNER**	46	•	•	•	•	•							•			
⚠	**POAST**	47						•	•			•			•		
—	RIVAL SPRING SUMMER FALL	50	·		·			:	:	·	·	·			·		
◈	SABRE/BROMOX 720M	53	•	•	•	•	•	•						•			
—	**SENCOR**	54	•		•							•	•		•[h]	•	
⚠	**STAMPEDE 360**	57	•		•	•		•									
⚠	STAMPEDE CM	59	•		•	•		•									
⚠	TARGET	61	•	•	•	•								•			
◈	**TCA**	60			•	•		•	•			•		•			
◈	**TORCH DS**	62	•	•	•	•	•	•									
⚠	TORDON 202-C	64	•		•									•			
—	TREFLAN SPRING SUMMER FALL	65	·		·			:	:	·	·	·			·		
—	**TRIFLUREX** SPRING SUMMER FALL	68	·		·			:	:	·	·	·	·		·		
⚠	**TROPOTOX PLUS**	70	•		•	•	•										
◈	2,4-D[1]	71	•	•	•		•				•						

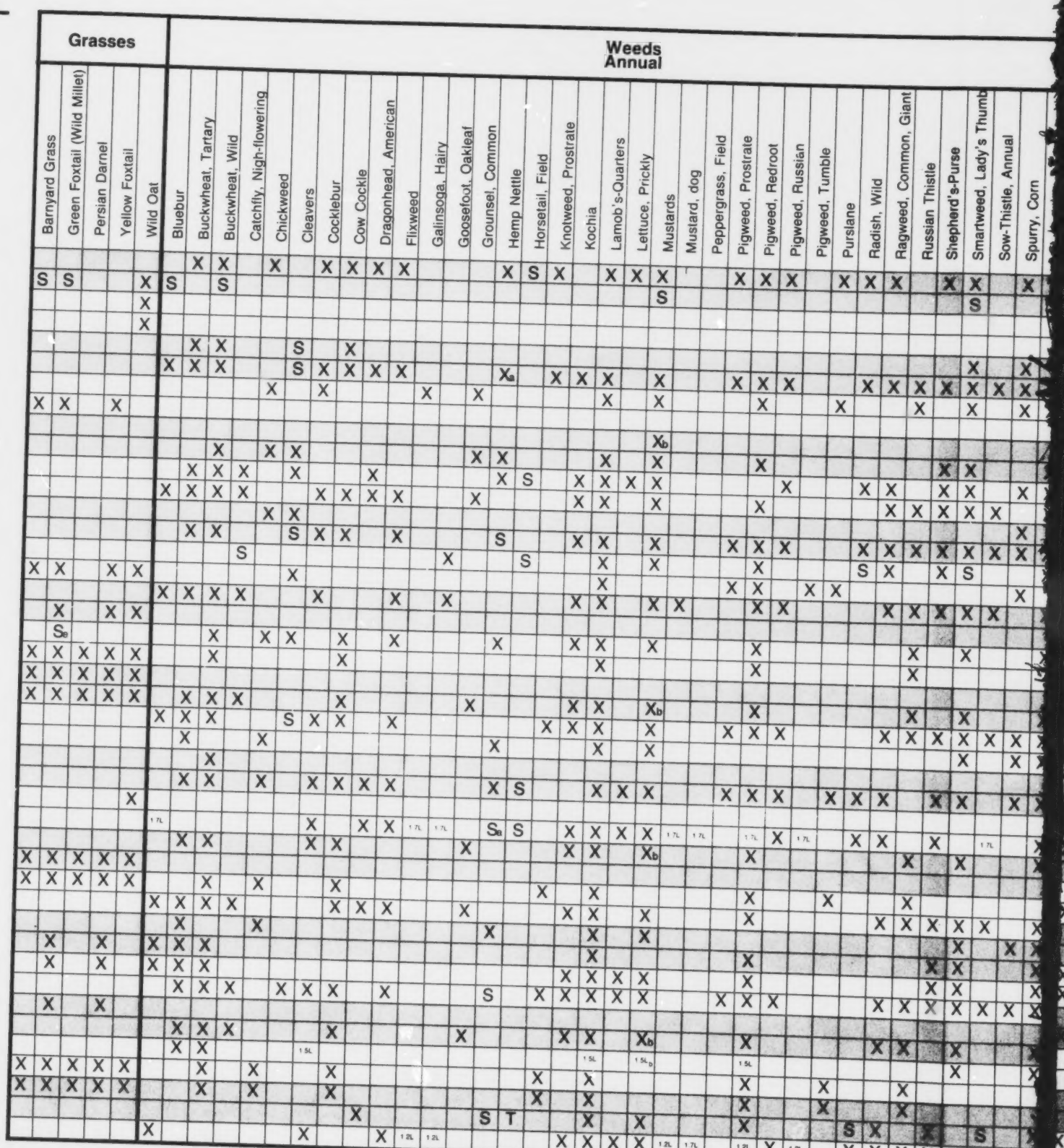
Poison Hazard

See Page 7 for safety procedures.

☠ Danger ◈ Warning ⚠ Caution

— No warning symbol required.

X — CONTROLLED BY RATE GIVEN FOR CROP
T — TOP GROWTH CONTROL ONLY — NEW GROWTH WILL COME BACK FROM TI
S — SUPRESSION ONLY
• — REGISTERED FOR USE IN THIS CROP



FOOTNOTES:

a — MCPA K
b — WILD MUSTARD ONLY
c — SPRING SEEDLINGS ONLY
d — SODIUM OR AMINE SALT
e — FALL APPLICATION ONLY
f — FALL APPLICATION FOR REDUCED TILLAGE FALLOW
h — TREFLAN TAN-MIX ONLY
i — MCPA AMINE

Weeds Annual																								Biennials				Perennials							Volunteer Crops as Weeds Read Page 85 for Precautions									
Kochia	Lamb's-Quarters	Lettuce, Prickly	Mustards	Mustard, dog	Peppergrass, Field	Pigweed, Prostrate	Pigweed, Redroot	Pigweed, Russian	Pigweed, Tumble	Purslane	Radish, Wild	Ragweed, Common, Giant	Russian Thistle	Shepherd's-Purse	Smartweed, Lady's Thumb	Sow-Thistle, Annual	Spurry, Corn	Stinkweed	Sunflower, Prairie	Burdock, Common	Goat's Beard	Wormwood, Biennial	Scentless Chamomile	Bindweed, Field	Dandelion	Dock	sow-Thistle, Perennial	Spurge, Leafy	Thistle, Canada	Quack grass	Wheat	Barley	Oats	Rye	Flax	Canola	Mustard	Sunflowers	Corn
	X	X	X			X	X	X		X	X	X		X	X		X	X	X		X								S										
			S												S			S													S	S	X							
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			X_b																											X										
	X		X				X							X	X			X																					
X	X	X	X					X			X	X		X	X		X	X	X	X						T		T					S	X					
X	X		X				X					X	X	X	X	X				X			X_c			T		T							X	X	X			
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X		X			X	X	X				X	X	X	X	X	X	X	X								T		T					S	X	X				
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X		X_b				X					X	X		X			X																						
1.5L		1.5L_b				1.5L																																	
X						X			X			X													T		T		T											
X						X			X			X																											
X		X				X				S	X		X		S		X							T	T	T		T							X	X				
X	X	X	1.2L	1.7L		1.2L	X	1.2L		X	X	X	X		1.2L		X	X	X	X	1.7L			1.2L T	1.2L T	1.2L T	1.2L T	1.2L T	1.2L T					1.2L T	1.2L	1.2L				

NLY
OR REDUCED TILLAGE FALLOW
LY

NOTE: Where a rate higher or lower than the maximum rate given for the crop is required for control, the actual rate required is shown in L or kg/ha in the weed section of the chart.
[1]These rates are for the amine formulations of 2,4-D and MCPA (500 g active ingredient/litre).

Conversion factors for other formulations are on page 73.

Sabre, Bromox 720 M (bromoxynil and MCPA 1:1)

Activity: bromoxynil and MCPA (1:1) 720 g active ingredient/litre

Registered Uses:

Crops	Recommended Rate of Product
Wheat (spring, durum, winter), barley, oats, canary seed, fall rye, flax	0.78 L/ha (0.32 L/ac)

At 0.78 L/ha one 12.5 litre container treats 16 ha (39.5 ac).
At 0.78 L/ha one 6.25 litre container treats 8 ha (19.8 ac).

Weeds controlled: Wild buckwheat, tartary buckwheat, common buckwheat, green smartweed, pale smartweed, lady's-thumb, redroot pigweed, lamb's-quarters, ball mustard, wild mustard, tumbling mustard, volunteer canola, cow cockle (seedling to 4-leaf stage), Russian thistle (seedling to 5 cm (2 in.) high), stinkweed, bluebur, common ragweed, flixweed, shepherd's-purse, scentless chamomile (spring annuals only), volunteer sunflower, top growth control of Canada thistle and perennial sow-thistle.

Application:

For ground application apply in 100 L/ha (40 L/ac) of water at a pressure of 275 kPa (40 psi) and a ground speed of 5.6-8 km/h (4-5 mph). Continuous agitation is required.

Timing:

Spray before weeds are past the 5-leaf stage. For cereal crops apply in spring from the 2- leaf stage to early flag-leaf stage of the crop. Do not apply during or after the boot stage. Treat when flax is 5-10 cm (2-4 in.) high. Treat canary seed from the 3-5 leaf stage.

Mode of Action:

Bromoxynil is a contact herbicide. Therefore, thorough coverage of the weeds is required for good control.

Precautions:

1. In flax, some leaf burn and retarded growth may delay maturity 2-3 days. Severe injury may result if flax is treated when the plants are under stress. Do not spray in hot, humid weather or when daytime temperature is over 29 C.
2. DO NOT apply during hot, humid weather as this may result in temporary leaf scorch.
3. DO NOT apply if rainfall is expected within 30 minutes.
4. There are no grazing restrictions.
5. Heated storage is not required.

Mixing:

1. Mix SABRE or BROMOX 720 M at the recommended rate with AVENGE at 3.5-4.25 L/ha (1.40- 1.70 L/ac) for control of wild oats and broadleaf weeds in **barley** and those varieties of **wheat** (spring, durum) registered for Avenge 200-C. Spray wild oats between the 3 to 5 leaf stage. Use 100 L of water/ ha (40 L/ac).
2. Mix SABRE or BROMOX 720 M at the recommended rate with MCPA ester at 0.56 L/ha (0.23 L/ac) for control of hemp-nettle and top growth of Canada thistle and sow thistle in **wheat**, **barley**, and **oats**. Treat hemp-nettle from the 2 to 4 leaf stage, and use 100 L of water/ha (40 L/ac).
3. Mix SABRE or BROMOX 720 M at the recommended rate with POAST at recommended rates to control broadleaf and grassy weeds in **flax**. Apply in a minimum 100 L of water/ha (40 L/ac) when the grass weeds are in the 2 to 5 leaf stage and flax is 5-10 cm (2-4 in.) tall. Follow the mixing instructions as recommended for Poast (see page 47). This tank-mix may increase the possibility of crop scorch.

Sencor 75 DF, Sencor 500 (metribuzin)

Activity: Sencor 75 DF 75% dry flowable
Sencor 500 500 g active ingredient/litre

Registered Uses:

Crops	Recommended Rates of Product	
	Sencor 75 DF	**Sencor 500**
Barley	275-375 g/ha (111-152 g/ac)	425-550 mL/ha (172-223 mL/ac)
Johnston, Leduc and Klondike	275 g/ha (111 g/ac)	425 mL/ha (172 mL/ac)
Wheat (spring, durum)	275 g/ha (111 g/ac)	425 mL/ha (172 mL/ac)
Lentils	275 g/ha (111 g/ac)	425 mL/ha (172 mL/ac)
Field Peas	275-375 g/ha (111-152 g/ac)	425-550 mL/ha (172-223 mL/ac)
Triazine tolerant canola	275 g/ha (111 g/ac)	425 mL/ha (172 mL/ac)
Fababeans	Sencor + Treflan (tank-mix only)	(See tank-mix section below)

At 275-375 g/ha one 3 kg container treats 10.9-8.0 ha (27.0-19.8 ac).
At 425-550 mL/ha one 5 litre container treats 11.8-9.1 ha (29.0-22.5 ac).

Weeds controlled: Hemp-nettle, chickweed, corn spurry, lamb's-quarters, stinkweed, volunteer canola, wild mustard, tartary buckwheat, ball mustard, smartweed, lady's-thumb. Wild buckwheat is not controlled. Use the higher rate for best residual control of chickweed and hemp-nettle or when weed infestation is heavy.

Application:

Apply in 100 L of water/ha (40 L/ac). Sprayer should be equipped with tips no finer than 6502, 8002 or LF2, nozzle screens no finer than 50 mesh and 50 mesh or larger line strainers. A pump of sufficient capacity to provide adequate volume through the by-pass and/or jet agitation system is essential.

Timing:

1. Apply when the cereal crop is in the 2-5 leaf stage. Crop must be seeded at least 5 cm (2 in.) deep.
2. Apply to lentils or peas prior to 15 cm (6 in.) vine length in 170 L of water/ha (68 L/ac) to reduce the risk of crop injury. Do not use on lentils or peas seeded less than 5 cm (2 in.) deep or in soils with less than 4% organic matter. Allow 3 days after cool, wet weather before application to lentils or peas.
3. Apply to triazine tolerant canola in a minimum 170 L of water/ha (68 L/ac) after weeds have emerged and are less than 5 cm (2 in.) in height or diameter. Allow 3 days after cool, wet weather before application. Note: THIS TREATMENT IS FOR USE ONLY ON TRIAZINE TOLERANT CANOLA (Variety OAC Triton pedigreed seed only). NON-TRIAZINE TOLERANT CANOLA WILL BE KILLED BY SENCOR.

Mode of Action:

Sencor is a systemic herbicide and kills susceptible plants by inhibiting photosynthesis. Control may not be noticeable for 7-10 days after treatment.

Precautions:

1. Sencor may be applied when the crop is wet with dew but weed control may be reduced if there is rainfall within 6 hours after application.
2. Initial temporary (7-10 days) lightening in crop color and occasionally a slight reduction in crop height may occur especially if frost or abnormally high temperatures occur within 1-2 days of application. If frost occurs prior to application, allow 4-5 days for crop to recover before applying Sencor.
3. DO NOT use on crops underseeded to forages.
4. DO NOT graze or feed treated crops to livestock within 30 days of application. Do not harvest for grain within 60 days of application.
5. DO NOT harvest triazine tolerant canola for seed within 75 days of application.
6. Continuous agitation is required during spraying. Do not let spray mixture stand without agitation or settling may occur.
7. Allow a 4-5 day interval between application of Sencor and wild oat herbicides.

Sprayer Clean-up:

Drain any remaining spray solution of SENCOR from the spray tank and discard in non-crop areas away from water supplies. Rinse the spray tank and refill with water adding a heavy- duty detergent at the rate of 250 mL/100 L of water. Recycle this mixture through the equipment for 5 minutes and spray out. Repeat this procedure twice. Fill the spray tank with clean water, recycle for 5 minutes, and spray out. Clean pump and nozzle screens thoroughly. Wash away any spray mixture from the outside of the spray tank, nozzles or spray rig.

Mixing:

1. Mix SENCOR or SENCOR DF at the recommended rates on **barley** and **wheat** with:
   (a) 2,4-D amine or MCPA amine at 0.84-1.1 L/ha (0.34-0.45 L/ac) when the crop is in the 3-5 leaf stage or
   (b) BANVEL LH at 275 mL/ha (111 mL/ac) or BANVEL HERBICIDE at 230 mL/ha (93 mL/ac) when the crop is in the 2-3 leaf stage. DO NOT apply to Klondike, Johnston or Leduc barley or;
   (c) TARGET at 1.0-1.5 L/ha (0.40-0.61 L/ac) when the crop is in the 2-3 leaf stage. Application of these tank mixes at later crop stages may result in reduced crop tolerance especially if the crop is under stress. DO NOT apply these mixtures to Klondike, Johnston, or Leduc barley.
2. Mix SENCOR 500 or SENCOR 75 DF with TREFLAN EC for broadleaf and grassy weed control in **fababeans**. Apply fall or spring (before planting) in 100 L of water/ha (40 L/ac) and incorporate immediately following the recommendation for Treflan incorporation.
   (a) For spring application mix SENCOR 500 at 550-850 mL/ha (223-344 mL/ac) or SENCOR 75 DF at 375-550 g/ha (152-223 g/ac) with TREFLAN at 1.5-2.0 L/ha (0.61-0.81 L/ac).
   (b) For fall application mix SENCOR 500 at 850 mL/ha (344 mL/ac) or SENCOR 75 DF at 550 g/ha (223 g/ac) with TREFLAN at 2.0-2.6 L/ha (0.81-1.10 L/ac).

3. SPECTRUM PROGRAM FOR TRIAZINE TOLERANT CANOLA

Mix SENCOR 500 or SENCOR 75 DF with TREFLAN EC for grassy and broadleaf weed control, including stinkweed and wild mustard, in **triazine tolerant canola**. Apply fall or spring (before planting) in 100 L of water/ha (40 L/ac) and incorporate immediately following the recommendations for Treflan incorporation.
(a) For spring application mix SENCOR 500 at 425-550 mL/ha (172-223 mL/ac) or SENCOR DF at 275-375 g/ha (111-152 g/ac) with TREFLAN at 1.5 L/ha (0.61 L/ac) on light soils with less than 6% organic matter. On medium or heavy soils with 6-15% organic matter apply SENCOR 500 at 550-850 mL/ha (223-344 mL/ac) or SENCOR 75 DF at 375-550 g/ha (152-223 g/ac) with TREFLAN at 2.0 L/ha (0.81 L/ac).
(b) For fall application mix SENCOR 500 at 550-700 mL/ha (223-283 mL/ac) or SENCOR 75 DF at 375-475 g/ha (152-192 g/ac) with TREFLAN at 2.0 L/ha (0.8l L/ac) on light soils with less than 6% organic matter. On medium or heavy soils with 6-15% organic matter apply SENCOR 500 at 700-850 mL/ha (223-344 mL/ac) or SENCOR 75 DF at 475-550 g/ha (192-223 g/ac) with TREFLAN at 2.6 L/ha (1.10 L/ac).
Note: SENCOR rate varies with soil organic matter; the higher the organic matter the higher the rate of Sencor required. Refer to table below.

Always add Sencor to the spray tank first. Continuous agitation is required throughout the mixing and spraying operations. FOLLOW ALL LAND PREPARATION, MIXING, SPRAYING, INCORPORATION DIRECTIONS AND PRECAUTIONS AS OUTLINED ON THE SENCOR AND TREFLAN LABELS. THIS TANK-MIX IS FOR USE ONLY ON TRIAZINE TOLERANT CANOLA. NON-TRIAZINE TOLERANT CANOLA WILL BE KILLED BY THIS TANK-MIX.

4. When applying SENCOR 500 or SENCOR 75 DF post-emergence to triazine tolerant canola DO NOT tank-mix with any other pesticides, fertilizers or spray adjuvants.

% Organic Matter	Spring		Fall	
	Sencor 500	Sencor 75DF	Sencor 500	Sencor 75DF
2-3	425 mL/ha	275 g/ha	550 mL/ha	375 g/ha
3-6	550 mL/ha	375-400 g/ha	700 mL/ha	475 g/ha
6-10	550-850 mL/ha	400-550 g/ha	700-850 mL/ha	475-550 g/ha
10-15	850 mL/ha	550 g/ha	850 mL/ha	550 g/ha

On soils with 10% organic matter and higher, broadleaf control may not be adequate.

Sinbar (terbacil)

Activity: 80% wettable powder

Registered Uses:

Crop	Recommended Rates of Product
Alfalfa (established at least 1 year)	0.7-1.5 kg/ha (0.28-0.61 kg/ac)

At 0.7-1.5 kg/ha one 2 kg bag treats 2.8-1.3 ha (7.1-3.3 ac).

Weeds controlled: Annual bluegrass, annual sow-thistle, barnyard grass, chickweed, downy brome, green foxtail, lamb's-quarters, mustard, perennial ryegrass, pigweed, prickly lettuce, purslane, ragweed, shepherd's-purse, stinkweed, wild barley.

Application:

1. Apply in a minimum of 200 L of water/ha (80 L/ac).
2. Use lower rate on lighter soil (sandy loams, loams) and higher rates on heavier soils (clay loams, clays).
3. When using a wettable powder certain precautions and sprayer adjustments must be made to ensure that it is applied correctly. Be sure that the sprayer is equipped with 50 mesh line strainers and screens. Stainless steel or hardened stainless steel nozzles are recommended. Also, pumps must be of sufficient capacity for adequate agitation through the by-pass or jet agitator which should terminate in the bottom of the tank.

Timing:

Apply after alfalfa goes dormant in the fall or before new growth starts in the spring. Do not apply after new growth starts, as crop injury may result.

Mode of Action:

Sinbar must be moved into the root zone of weeds with moisture where it can be absorbed by the root system. Once in the plant, it strongly inhibits photosynthesis.

Precautions:

1. DO NOT use on soils containing less than 1% organic matter.
2. DO NOT replant to any crop within 2 years after last application as injury may result.
3. DO NOT overlap spray swaths.
4. Moisture is necessary to activate the chemical.
5. Thoroughly clean all traces of Sinbar from application equipment immediately after use.
6. There is no grazing restriction.

Mixing:

DO NOT tank-mix SINBAR with other herbicides, fertilizers or spray adjuvants.

Stampede 360 (propanil)

Activity: 360 g active ingredient/litre

Registered Uses:

Crops	Recommended Rate of Product
Wheat (spring, durum), barley, oats, flax	2.75 L/ha (1.10 L/ac)

At 2.75 L/ha one 22.7 litre container treats 8.2 ha (20.4 ac).

Weeds controlled: Green foxtail (wild millet, pigeon grass), yellow foxtail, wild buckwheat, tartary buckwheat, redroot pigweed, lamb's-quarters, stinkweed (rosette stage), shepherd's-purse, bluebur, smartweed, lady's-thumb.

Application:

Apply in 100 L of water/ha (40 L/ac) using flat fan nozzles (e.g. LF2-80 degrees, 8002, 6502, LF2-65 degrees, etc.) and 275 kPa (40 psi). Use 50 mesh screens in nozzles and pump. Maintain a three-day interval between application of Stampede 360 and other herbicides. Application may be made with floater-type equipment, with best results at 150 L water/hectare (60 L/ac) and 275 kPa (40 psi) and at speeds not in excess of 16 km/h (10 mph). Application by aircraft or other low volume equipment is not recommended.

Timing:

Apply when the majority of green foxtail is in the 3-leaf stage and less than 2.5 cm (1 in.) in height. Broadleaved weeds should be in the 2-4 leaf stage. Under dry conditions (more than 5 cm (2 in.) of dry soil at the surface), apply when green foxtail is in the 2- 3 leaf stage, since control of green foxtail in the 4-leaf stage and beyond will not be satisfactory under dry soil conditions.

Apply when cereal crops are in the 2-5 leaf stage. Apply to flax at least 5 cm (2 in.) but not more than 12.5 cm (5 in.) in height. Do not spray flax when the temperature exceeds 30 C. Under stress conditions, suppression of flax growth immediately after treatment and some delay in maturity can be expected.

Mode of Action:

Stampede is a contact herbicide, therefore, thorough coverage of the weeds and proper timing are important. Note: Stampede may cause temporary crop yellowing or leaf-tip burn 2-5 days after application.

Insecticides:

Injury of crop plants may result from a tank-mix or sequential application of Stampede 360 and certain insecticides. If an insecticide is required in the same year that Stampede 360 has been or will be applied, use the recommended insecticides as follows:

The insecticide Decis (deltamethrin) may be applied at any time before or after an application of Stampede 360, or as a tank-mix with Stampede 360. Consult the Decis label for application rate and other instructions. Furadan (carbofuran) may be applied on wheat five days after an application of Stampede 360 or on barley ten days after an application of Stampede 360. Cygon (dimethoate) or malathion may be applied 14 days after an application of Stampede 360. **No other insecticides can be used during the same year that Stampede 360 is applied.** Crops grown from seed protected with dual purpose seed dressings may be treated with Stampede.

Precautions:

1. DO NOT apply to crops under severe drought stress.
2. DO NOT use water that is colder than 10 C.
3. Spray out Stampede 360 within 6 hours of mixing to prevent crystalization on screens. Empty and wash out spray tank after each day's spraying.
4. Stampede 360 may be stored at freezing temperatures but must be returned to its original state by warming to room temperature (20-22 C) and agitating thoroughly on several successive days before use.
5. DO NOT spray if rainfall is expected within 1 hour.
6. There are no grazing restrictions.

Mixing:

1. Mix STAMPEDE 360 with:
   (a) MCPA ESTER at 0.55 L/ha (0.22 L/ac) to control a wider spectrum of broadleaf weeds

in **wheat**, **barley** and **oats** when in the 2-5 leaf stage and **flax** when it is 5-12.5 cm (2-5 in.) high.
(b) 2,4-D AMINE at 1.2 L/ha (0.49 L/ac) or 2,4-D LV ESTER 600 g active ingredient/litre at 0.66-1.0 L/ha (0.28-0.40 L/ac) to control a wider range of broadleaf weeds, including Russian thistle. Apply to **wheat** only when it is in the 4 to 5 leaf stage. Use the low rate of 2,4-D ester for durum wheat.

2. Mix STAMPEDE 360 with GLEAN at 15-30 g/ha to control green foxtail and broadleaf weeds in **wheat** and **barley** (**Argyle**, **Beford**, and **Klages** only). Apply when the crop is in the 2-5 leaf stage and the majority of foxtail is in the 3-leaf or smaller stage. Ensure Glean is in suspension before adding Stampede 360, followed by the required amount of surfactant. Continuous agitation is required.
3. Always add 2,4-D, MCPA or Glean to the spray tank prior to adding Stampede 360.
4. DO NOT tank-mix Stampede 360 with any other pesticides (except as recommended), fertilizers or additives. A 3-day interval should be allowed before or after application of Stampede 360 and any other herbicide.

Stampede CM (propanil and MCPA ester 7:2)

Activity: 460 g active ingredient/litre

Registered Uses:

Crops	Recommended Rate of Product
Barley, oats, flax, wheat (spring, durum), canary seed	2.75 L/ha (1.10 L/ac)

At 2.75 L/ha one 22.7 litre container treats 8.2 ha (20.4 ac).

Weeds controlled: Green foxtail (wild millet, pigeon grass), yellow foxtail, lady's- thumb, smartweed, lamb's-quarters, redroot pigweed, wild buckwheat, tartary buckwheat, bluebur, wild mustard, stinkweed, shepherd's-purse, volunteer canola, kochia, flixweed.

Application:

Apply in 100 L of water/ha (40 L/ac) using flat fan nozzles (e.g. LF2-80 degrees, 8002, 6502, LF2-65 degrees, etc.) and 275 kPa (40 psi). Use 50 mesh screens in nozzles and pump. Maintain a 3-day interval between application of Stampede CM and other herbicides. Application may be made with floater-type equipment, with best results at 150 L water/ha (60 L/ac) and 275 kPa (40 psi) and at speeds not in excess of 16 km/h (10 mph). Application by aircraft or other low volume equipment is not recommended.

Timing:

Apply when the majority of green foxtail are in the 3-leaf stage and less than 2.5 cm (1 in.) in height. Broadleaved weeds should be in the 2-4 leaf stage. Under dry conditions (more than 5 cm (2 in.) of dry soil at the surface), apply when green foxtail is in the 2- 3 leaf stage, since control of green foxtail at the 4-leaf stage and beyond will not be satisfactory under dry soil conditions.

Apply when the cereal is in the 2-5 leaf stage and when the canary seed is in the 2-4 leaf stage. Apply to flax when it is at least 5 cm (2 in.) tall, but not more than 12.5 cm (5 in.) tall. Do not spray flax when the temperature exceeds 30 C. Undre stress conditions, suppression of flax growth immediately after treatment and some delay in maturity can be expected.

Mode of Action:

Stampede CM is a contact herbicide, therefore thorough coverage of the weeds and proper timing are essential. Stampede CM may cause temporary crop yellowing or leaf-tip burn 2-5 days after application. Under normal growing conditions these effects are temporary and new growth is normal.

Insecticides:

Injury of crop plants may result from a tank-mix or sequential application of Stampede CM and certain insecticides. If an insecticide is required in the same year that Stampede CM has been or will be applied, use the recommended insecticides as follows:

Decis (deltamethrin) may be applied at any time before or after an application of Stampede 360. Furadan (carbofuran) may be applied on wheat five days after an application of Stampede CM or on barley ten days after an application of Stampede CM. Cygon (dimethoate) or malathion may be applied 14 days after an application of Stampede CM. **No other insecticides can be used during the same year that Stampede CM is applied.** Crops grown from seed protected with dual purpose seed dressings may be treated with Stampede.

Precautions:

1. DO NOT apply to crops under drought stress.
2. DO NOT use water that is colder then 10 C.
3. Spray out Stampede CM within 6 hours of mix ing to prevent crystallization on screens. Empty and wash out spray tank after each day's spraying.
4. Stampede CM may be stored at freezing temperatures but must be returned to its original state by warming to room temperature (20-22 C) and agitating thoroughly on several successive days before use.
5. DO NOT apply if rain is expected within 1 hour.

Mixing:

DO NOT tank-mix STAMPEDE CM with other herbicides, insecticides, fertilizers or spray adjuvants (wetting agents). A three day interval should be allowed before or after application of Stampede CM and any other herbicide.

TCA, NaTA, Bar-Fox DS (TCA)

Activity: TCA/NaTA 850 g active ingredient/kg
Bar-Fox 830 g active ingredient/kg

Registered Uses:	**Recommended Rates of Product TCA/NaTA/Bar-Fox**
Crops	
Barley	1.3 kg/ha (0.53 kg/ac)
Oats	1.3-2.7 kg/ha (0.53-1.10 kg/ac)
Canola	2.7-4.5 kg/ha (1.10-1.82 kg/ac)
Flax	4.0-5.4 kg/ha (1.6-2.2 kg/ac)
Peas (field)	4.5-5.4 kg/ha (1.82-2.2 kg/ac)

Weeds controlled: Green and yellow foxtail.

Application and Timing:

1. Use the lower rate on light, sandy soils.
2. Barley and Oats - apply in 90-100 L of water/ha (35-40 L/ac) when the weeds have 1-3 leaves and the crop has 2-4 leaves.
3. Canola and Flax - apply in 100-165 L of water/ha (40-65 L/ac) before the weeds have 4 true leaves. Canola should be in the 2-4 leaf stage. Flax should be 10-15 cm (4-6 in.) tall.
4. Peas - apply in 100-165 L of water/ha when weeds are in the 1-3 leaf stage and pea vines are 10-15 cm (4-6 in.) long.

Mode of Action:

1. TCA acts mainly through the soil so activity will be greatest on sandy soil and under good moisture conditions.
2. TCA inhibits growth of the weeds. Rates recommended for cereals will severely stunt green foxtail but do not usually give complete kill.
3. Delay in barley and oat maturity may occur.

Precautions:

1. Oats and barley should be seeded 5 cm (2 in.) deep or deeper to reduce chances of crop injury.
2. Flush the sprayer thoroughly after each use.
3. Adequate agitation and gradual addition of material to spray tank is needed during mixing to completely dissolve TCA. Pre-dissolve TCA in a small amount of warm water to ensure quick and complete mixing.
4. DO NOT graze treated areas for at least 24 hours after treatment.
5. Use 50 mesh screens and filters. Stainless steel or hardened stainless steel nozzle tips are recommended. Pumps should be of sufficient capacity for adequate agitation through the by-pass or jet agitator which should terminate in the bottom of the tank.
6. A light rain after application is beneficial.
7. Not all brands of TCA are registered for the same uses. Refer to product labels for complete details.

Mixing:

1. Mix TCA, NaTA or Bar-Fox at the recommended rate with 2,4-D AMINE up to 1.1 L/ha (0.45 L/ac) to control broadleaf weeds and green foxtail in **barley**. Apply at the 4-leaf stage of the crop when the weeds are in the 1-3 leaf stage. Use 100 L of water/ha (40 L/ac). Completely dissolve TCA in water before adding 2,4-D. Flush sprayer tank thoroughly with water after applying TCA.
2. Mix TCA, NaTA or Bar-Fox at recommended rates with:
   (a) MCPA AMINE up to 1.1 L/ha (0.45 L/ac) or
   (b) MCPA SODIUM SALT up to 1.9 L/ha (0.77 L/ac) to control green foxtail and broadleaf weeds in **barley, oats** and **flax**. Apply when the cereal is in the 2-4 leaf stage, flax is 5-10 cm (2-4 in.) tall and the weeds are in the 1-3 leaf stage. Use the lower rate of TCA on sandy soils. Apply in 100 L of water/ha (40 L/ac). Completely dissolve TCA in water before adding MCPA . Flush sprayer tank thoroughly with water after applying TCA.
3. Mix TCA, NaTA or Bar-Fox at the recommended rate in **peas** with:
   (a) MCPA AMINE up to 0.56 L/ha (0.23 L/ac) or
   (b) MCPA SODIUM SALT up to 0.70 L/ha (0.28 L/ac) when peas are 10-20 cm (4-8 in.) tall. Completely dissolve TCA in water before adding to broadleaf herbicide.

Target (dicamba + mecoprop + MCPA, 1:1:4.4)

Activity: 400 g active ingredient/litre

Registered Uses:

Crops	Recommended Rates of Product
Wheat (spring, durum, winter), barley, oats, canary seed	1.0-1.5 L/ha (0.40-0.61 L/ac)

At 1.0-1.5 L/ha one 10 litre container treats 10.0-6.7 ha (24.7-16.5 ac).

Weeds controlled: Hemp-nettle*, wild buckwheat, annual smartweed species, Russian thistle, sow-thistle, corn spurry, knotweed, volunteer buckwheat, ragweed, stinkweed, mustards (except dog mustard), pigweeds (prostrate, redroot), lamb's-quarters, cow cockle, tartary buckwheat, volunteer sunflowers, flixweed, shepherd's-purse, volunteer canola, cleavers (1.5 L/ha), kochia, night-flowering catchfly, top growth control of Canada thistle, field bindweed and field horsetail.

*Suppression only

Application:

Use at least 100 L of water/ha (40 L/ac) to reduce the risk of crop injury.

Timing:

1. Spray at the 3-4 leaf stage of wheat, oats and canary seed, and the 3-leaf stage of barley. Treatment at the 3-leaf stage of the crop will usually combine maximum crop tolerance and weed susceptibility. Apply to winter wheat in spring before crop is 30 cm (12 in.) high.
2. Application at higher rates or after the 4-leaf stage or at low water volumes will usually result in stem bending and delayed maturity. Under conditions conducive to prolific tillering, the yield may also be reduced. Very severe yield losses due to sterility will result from treatment during the flag leaf to the early heading stage.

Mode of Action:

Target is a translocated herbicide which affects the root of the plant. It is slower acting than most other broadleaf herbicides and death of the plants may take 2-3 weeks.

Precautions:

1. DO NOT use on cereals underseeded to legumes.
2. DO NOT freeze.
3. DO NOT apply if rainfall is expected within 3 hours.
4. DO NOT graze or harvest for livestock feed prior to crop maturity.

Mixing:

1. Mix TARGET at recommended rates with SENCOR 500 at 275-425 mL/ha (111-172 mL/ac) for control of chickweed and other broadleaf weeds in **wheat** and **barley**. Application of this tank-mix at late crop stages may result in reduced crop tolerance especially if the crop is under stress. Do not use this tank-mix on oats. Do not apply to KLONDIKE, JOHNSTON or LEDUC barley.
2. Mix TARGET at recommended rates with AFOLAN F at 470 mL/ha (190 mL/ac) or LOROX L at 425 mL/ha (172 mL/ac) for control of chickweed and other broadleaf weeds in **wheat**, **oats** and **barley**.
3. For control of winter annuals in **winter wheat**, Target at recommended rates can be mixed with 28-0-0 liquid fertilizer as the spray carrier instead of water. Apply in a minimum of 110 L/ha (45 L/ac) in the spring when crop and weeds commence to grow. Late application may result in crop injury. Consult fertilizer recommendations in regard to the most efficient method of applying nitrogen fertilizer.

Torch DS (bromoxynil)

Activity: 450 g active ingredient/litre

Registered Uses: Crops	**Recommended Rates of Product**
Wheat (spring, durum, winter), barley, oats, triticale, canary seed, fall rye	625-750 mL/ha (253-304 mL/ac)
Flax	625 mL/ha (253 mL/ac)
Seedling grasses (bromegrass, timothy, slender wheatgrass, creeping red fescue, reed canarygrass, crested wheatgrass, orchard- grass, tall wheatgrass, intermediate wheatgrass, Russian wild ryegrass and meadow fescue)	875 mL/ha (354 mL/ac)

At 625 mL/ha one 10 litre container treats 16 ha (39.5 ac).

Weeds controlled: Wild buckwheat, tartary buckwheat, lady's-thumb, green smartweed, cow cockle, kochia, common groundsel, knawel, Russian thistle, stinkweed, lamb's-quarters, wild mustard, redroot pigweed, night-flowering catchfly, scentless chamomile (seedling only), common ragweed, American nightshade.

Application:

Apply in 100 L of water/ha (40 L/ac) at a pressure of 275 kPa (40 psi). Continuous agitation is required.

Timing:

1. Bromoxynil can be safely applied to cereals from the 2-leaf stage until the appearance of the flag-leaf and to flax when the crop is 5-10 cm tall (2-4 in.). Treat canary seed at the 3-5 leaf stage. Best results are obtained from applications made at the early leaf stages.
2. Apply when seedling grasses are in 2-4 leaf stage. Apply to grasses in the year of establishment only, not underseeded to a legume.
3. Apply when broadleaf weeds are in the 1-4 leaf stage. Stinkweed and wild mustard must be sprayed at a very early stage for optimum control.

Mode of Action:

Bromoxynil is a contact herbicide. Therefore, thorough coverage of the weeds is required for good control.

Precautions:

1. In flax, some leaf burn and retarded growth may delay maturity 2-3 days. Severe injury may result if flax is treated when the plants are under stress.
2. DO NOT apply bromoxynil or mixtures containing bromoxynil during hot, humid weather as temporary leaf scorch may result.
3. DO NOT apply if rainfall is expected within 30 minutes.
4. Torch DS requires heated storage.
5. DO NOT graze seedling grasses in the season in which they have been sprayed with bromoxynil.

Mixing:

1. Mix TORCH DS at the low recommended rate with AVENGE 200-C at 3.5-4.25 L/ha (1.40-1.70 L/ac) to control broadleaf weeds in **barley** and those varieties of **wheat** (spring, durum), registered for Avenge 200-C. Apply in 100 L of water/ha (40 L/ac) when the wild oats are in the 3-5 leaf stage. Add TORCH DS at start of filling then fill tank to 3/4 full and add AVENGE 200-C. Top off spray tank with remaining water.
2. Mix TORCH DS at the low recommended rate with MCPA at 0.56-0.84 L/ha (0.23-0.34 L/ac) to control a wide range of broadleaf weeds in **wheat**, **oats** and **barley**. In **flax** mix with MCPA AMINE at 0.56 L/ha (0.23 L/ac). Do not apply to flax in hot, humid weather. Cereal crops can be treated safely from the 2-leaf up to the flag leaf stage. Add MCPA to water first. To control hemp-nettle mix with MCPA at 1.12 L/ha (0.45 L/ac).

3. Mix TORCH DS at the low recommended rate with:
   (a) 2,4-D Amine at 0.56-0.84 L/ha (0.23-0.34 L/ac) or
   (b) 2,4-D LV Ester (600 g active ingredient/L) at 0.47-0.70 L/ha (0.19-0.28 L/ac) for broadleaf weed control in **wheat** and **barley. Do not apply the tank-mix with 2,4-D prior to the 4-leaf stage of the crop.**

NOTE: Torch DS is registered at a reduced rate of application in a tank-mix with 2,4-D ester to control certain broadleaf weeds in wheat and barley. However, sufficient data has not been made available to assess its performance in Saskatchewan.

4. Mix TORCH DS at the low recommended rate with HOE-GRASS at 2.5 L/ha (1.0 L/ac) to control grassy and broadleaved weeds in **spring wheat, barley (except Betzes, Norbert, Klages)** and **flax**. Apply in 100 L of water/ha (40 L/ac) at a pressure of 275 kPa (40 psi). Apply when the weeds are in the 1-3 leaf stage and before the grassy weeds have tillered. Do not apply when flax is less than 5 cm (2 in.) tall. Do not apply to barley after the 4- leaf stage or more than 21 days after crop emergence. During periods of stress (i.e. very hot (28 C)) and/or dry conditions or low humidity) plants are not actively growing. Better control of grassy weeds will be achieved if Hoe-Grass is applied alone rather than as a tank-mix with TORCH DS under these conditions.

Tordon 202-C (picloram + 2,4-D, 1:16)

Activity: 212 g active ingredient/litre

Registered Uses:

Crops	Recommended Rates of Product
Barley, Wheat (spring, durum)	1.5-2.0 L/ha (0.61-0.81 L/ac)

Weeds controlled: 1.5 L/ha - Russian thistle, redroot pigweed, lamb's-quarters, cocklebur, wild mustard. One 20 litre container treats 13.3 ha (32.9 ac).

2.0 L/ha - Wild buckwheat, spring stinkweed seedlings, green smartweed, tartary buckwheat, dandelion seedlings, Canada thistle top growth, perennial sow-thistle top growth. One 20 litre container treats 10 ha (24.7 ac).

Application:

Apply in a minimum of 100 L of water/ha (40 L/ac). Spray at 200-275 kPa (30-40 psi). Use ground spray equipment only.

Timing:

Apply when the crop is in the 3-5 leaf stage.

Mode of Action:

Picloram is a growth regulator type herbicide and is absorbed by both roots and leaves and is translocated to all parts of the plant. It can remain active in the soil throughout the growing season and will control some late germinating weeds. The weeds will not die immediately after treatment. The rate of growth will slow and gradually cease and therefore will not compete with the crop growth or interfere with harvest. Wheat straw may be shortened slightly.

Precautions:

1. Rapeseed, mustard, canary seed, flax, rye, wheat, barley, oats, triticale, corn, sorghum or any grass seed can be grown on land treated with Tordon 202C in previous years. However, severe damage can result if barley or wheat crops underseeded to legumes are treated. Fields previously treated with Tordon 202C herbicide should not be planted to alfalfa and sunflowers until at least the third growing season after the year of treatment; beans, lentils, peas and potatoes until at least the fifth growing season after the year of treatment. It is recommended that a field bioassy using the susceptible crop(s) be undertaken the year prior to commercial production by seeding test strips of the susceptible crop(s) into the treated area and carefully observing growth and seed set. Pulse crop producers should carefully consider the long term effects on crop rotations before choosing this product.
2. Tordon is a very active herbicide on certain plants. Do not allow spray drift to contact sensitive crops or other desirable vegetation. Do not contaminate non-target land areas, cropland, water, irrigation or drainage ditches.
3. Grazing and manure: DO NOT use straw from treated crops for composting or mulching on susceptible broadleaf crops. If the straw is used for bedding or animal feed, return the manure to fields to be planted to grain crops, flax or canola. DO NOT permit meat animals being finished for slaughter nor dairy animals to forage or graze treated fields within 2 weeks of treatment.
4. DO NOT apply if rainfall is expected within 6 hours.
5. DO NOT freeze.

Sprayer Clean-Up Procedures:

1. Drain and flush the spray system with clean water in an area well away from sensitive crops or trees.
2. Fill the system with a 1:100 mixture of household ammonia and water; circulate the mixture through the system for five minutes, then let stand for 24 hours.
3. Drain the system and flush with clean water before use with other pesticides.

Mixing:

DO NOT tank-mix TORDON 202-C with any other herbicides or spray additives.

Treflan EC, QR5 (trifluralin)

Activity: Treflan 545 g active ingredient/litre
Treflan QR5 5% granules

Registered Uses:

Crops	Recommended Rates of Product		
	Fall Granular	**Fall Liquid**	**Spring Liquid**
Canola, sunflowers peas, mustard, fababeans	22-28 kg/ha (8.9-11.3 kg/ac)	2.0-2.6 L/ha (0.81-1.10 L/ac)	1.5-2.0 L/ha (0.61-0.81 L/ac)
Flax, lentils	22-28 kg/ha (8.9-11.3 kg/ac)	2.0-2.6 L/ha (0.81-1.10 L/ac)	Not Recommended
Wheat (spring, durum)	Not Recommended	Not Recommended	1.1-1.5 L/ha[1] (0.45-0.61 L/ac)
Barley	17-28 kg/ha[2] (6.9-11.3 kg/ac)	Not Recommended	1.1-1.5 L/ha[1] (0.45-0.61 L/ac)
Triazine tolerant canola		Spectrum[3]	Spectrum[3]

Summer Application: flax and canola only - 3.0 L/ha (1.21 L/ac), 34 kg/ha (13.8 kg/ac).

At 22-28 kg/ha one 25 kg bag treats 1.14-0.89 ha (2.8-2.2 ac). At 1.5-2.0 L/ha one 8.5 litre container treats 5.7-4.3 ha (14.0-10.5 ac).

Weeds controlled: Wild oats, green and yellow foxtail (wild millet), barnyard grass, wild buckwheat, cow cockle, redroot pigweed, lamb's-quarters, Russian thistle, chickweed, purslane, knotweed, Persian darnel.

[1]Rates recommended for barley and wheat will control green and yellow foxtail (wild millet) only.

[2]Use 17-22 kg/ha (6.9-8.9 kg/ac) in the brown soil zones with 2-4% organic matter. Use 22- 28 kg/ha (8.9-11.3 kg/ac) in the black soil zones with 4-6% organic matter.

[3]Spectrum program for triazine tolerant canola. See Mixing Section No. 4. In addition, Treflan recommendations for standard varieties of canola are applicable to triazine tolerant canola.

Application and Timing:

1. Use the lower rate on light sandy soils or soils with less than 6% organic matter. Use the higher rate on heavier soils (loams and clays) and all soils with 6-15% organic matter.
2. Do not apply to peat or muck soils, wet soils, soils in poor working condition or soils which contain more than 15% organic matter, or soils that are subjected to prolonged periods of flooding.
3. Fields should be cultivated to destroy existing growth before applying Treflan liquid. When applying to stubble fields, chop and thoroughly mix crop residues into the soil to a depth of 10 cm (4 in.). Disc type implements provide best results.
4. Apply Treflan EC in 100 L of water/ha (40 L/ac).
5. The granular formulation is best suited for use under trashy conditions and is recommended for **Summer and Fall application only**. If soil is hard or if trash cover is very heavy, precultivation is necessary to ensure adequate mixing of the granules in the soil. For best results the second incorporation should be done before spring. Incorporate as outlined below for summer and fall applications.

Spring - apply and incorporate once immediately, in the same operation if possible. Do not delay incorporation more than 8 hours after application. The second incorporation may be done at the time of seedbed preparation provided it is done at the recommended depth.

Fall - apply between September 1 and freeze-up. Incorporate immediately, in the same operation if

possible. Do not delay incorporation more than 8 hours after application. It is preferred to do both incorporations in the fall, followed by shallow tillage in the spring prior to planting. However one incorporation may be done in the fall and the second in the spring to a depth of 8-10 cm (3-4 in.).

Summer - apply between June 1 and September 1 and incorporate immediately, in the same operation is possible. Do not delay incorporation more than 8 hours after application. Second and subsequent incorporations may be done any time prior to soil freeze-up.

Incorporation:

For Oilseed and Pulse Crops

-Incorporate immediately. The first incorporation is best done in combination with the application operation and should not be delayed more than 8 hours after application. Two operations at right angles are required. When applied in the summer or fall, the second incorporation can be delayed until spring although two fall incorporations are preferred. When both incorporations are done in the fall, a shallow cultivation is required in the spring prior to planting.

Use a tandem disc, discer or vibrashank cultivator set to 8-10 cm (3-4 in.) deep. Operate disc implements at 7-10 km/h (4.3-6.2 mph) and cultivators at 8-10 km/h (5-6.2 mph). Rod-weeders, harrows or hoe-drills, deep tillage cultivators or chisel plows will not properly incorporate Treflan.

Special Instructions for Flax and Lentils:

a. Both incorporations should be completed before freeze-up in the fall prior to seeding flax or lentils the next spring.

b. Work the seedbed to a shallow depth and pack just prior to seeding to ensure a firm seedbed and accurate planting depth. Use a double disc press or hoe press drill. Seed into a moist seedbed no more than 4 cm deep (1.6 in.). Do not seed into cold soil. Seeding should generally be delayed until at least May 15. Conditions which result in slow germination and emergence will greatly increase the risk of a poor flax or lentil stand.

Special Instructions for Treflan QR5 Applied in Fall for Barley:

a. Use the recommended rates as it pertains to soil type for barley.

b. Do not apply Treflan QR5 for barley on land treated with Treflan, Rival, Heritage or Triflurex since June I of the previous year.

c. Do not apply on grey-wooded soils or other soils containing less than 2% organic matter, or on black/deep black soils containing more than 6% organic matter. Application to severely eroded knolls can result in reduced crop stand.

d. General directions for "Land Preparation", "Application" and "Incorporation" are the same as for use on oilseed crops.

e. Both incorporations of Treflan QR5 should be done in the season of application (fall).

f. Seeding should be with a press drill or hoe drill. Seed into a moist, warm seedbed with the drill set to seed shallow (no deeper than 5 cm (2 in.)).

g. Use of discers and air seeders can result in uneven and variable seeding depth. If they are used for seeding barley, the field should be packed after the seeding to give a firm seedbed.

h. **Do not seed early when soil conditions are cold.**

i. Conditions which result in slow germination and emergence will greatly increase the risk of a poor barley stand.

For Cereals - Spring application of Treflan EC in wheat and barley for control green foxtail (wild millet) only.

1. Seed crop 5-7.5 cm deep (2-3 in.).
2. Apply Treflan as soon as possible after seeding (before crop emergence). The soil surface should be free of trash.
3. Shallow incorporate with two passes of diamond or tine harrows in different directions at speeds of 8 km/h (5 mph). Application and first incorporation should be done in the same operation if possible. The second incorporation must be completed within 8 hours of application.

Mode of Action:

Treflan controls susceptible weeds by killing seedlings as they germinate. It does not control established weeds.

Precautions:

1. **Drought conditions in the year prior to seeding rotational crops such as wheat, may result in higher levels of Treflan in the soil. To reduce the possibility of injury to rotational crops, seed the crops shallow into a warm, moist seedbed.**
2. DO NOT use on oats, rye, triticale or forage grasses.
3. Wheat and barley will likely be injured if seeding through a treated layer or into a deeply incorporated layer of Treflan.
4. DO NOT apply to peat or muck soils, wet soils, soils in poor working condition or soils which contain more than 15% organic matter.

5. Oats, canary seed and forage grasses should not be grown in rotation following a Treflan treated crop.
6. Used as directed, and under normal conditions, Treflan will not harm the treated crop. However, seedling disease, cold weather, deep planting, excessive moisture, high salt concentration or drought may weaken crop seedlings and increase the risk of damage resulting in delayed crop development or reduced yields.
7. If allowed to freeze. Treflan liquid must be warmed to 15 C for 24 hours and shaken well before use.
8. With Treflan granules, avoid concentrating the material in narrow bands. Use a properly calibrated granule applicator that will apply the Treflan granules uniformly.
9. There are no grazing restrictions.

Mixing:

1. Mix TREFLAN EC at 1.1 L/ha (0.45 L/ac) on light soils and 1.5 L/ha (0.61 L/ac) on medium to heavy soils with AVADEX BW (liquid formulation) at 3.5 L/ha (1.40 L/ac) in **wheat** or 3.5-4.25 L/ha (1.40-1.70 L/ac) in **barley** for control of wild oats and green foxtail (wild millet). Use only on fields free of trash. Apply in 100 L of water/ha (40 L/ac) after seeding and incorporate with a double harrowing at right angles. Seed should be placed 5-7.5 cm (2-3 in.) deep.
2. Mix TREFLAN EC at 1.5-2.0 L/ha (0.61-0.81 L/ac) with AMIBEN at 9.25 L/ha (3.70 L/ac) to control wild mustard, stinkweed, and Treflan susceptible weeds in **sunflowers**. Use the lower rate of Treflan on sandy soils. Apply in the spring before planting using a minimum of 100 L of water/ha (40 L/ac). Incorporate immediately according to recommendations for Treflan in oilseed crops. Field experience indicates that very hard water may cause compatability problems with AMIBEN.
3. For broadleaf and grassy weed control in **fababeans** mix TREFLAN EC with metribuzin. Apply fall or spring (before planting) in 100 L of water/ha (40 L/ac) and incorporate immediately following the recommendations for Treflan incorporation. For fall application mix TREFLAN EC at 2.0-2.6 L/ha (0.81-1.10 L/ac) with;
   (a) LEXONE DF at 400-550 g/ha (162-223 g/ac) or
   b) SENCOR 75 DF at 550 g/ha (223 g/ac) or
   c) SENCOR 500 at 850 mL/ha (344 mL/ac).

   For spring application mix TREFLAN EC at 1.5-2.0 L/ha (0.60-0.81 L/ac) with;
   (d) LEXONE DF at 350-550 g/ha (142-223 g/ac) or
   (e) SENCOR 75 DF at 375-550 g/ha (152-223 g/ac) or
   (f) SENCOR 500 at 550 mL/ha (223 mL/ac).
4. SPECTRUM PROGRAM FOR TRIAZINE TOLERANT CANOLA. Mix TREFLAN EC with SENCOR 500 or SENCOR 75 DF for grassy and broadleaf weed control, including stinkweed and wild mustard, in **triazine tolerant canola**. Apply fall or spring (before planting) in 100 L of water/ha (40 L/ac) and incorporate immediately following the recommendations for Treflan incorporation.
   (a) For spring application mix TREFLAN at 1.5 L/ha (0.61 L/ac) with SENCOR 500 at 425- 550 mL/ha (172-223 mL/ac) or SENCOR 75 DF at 275-375 g/ha (111-152 g/ac) on light soils with less than 6% organic matter. On medium or heavy soils with 6-15% organic matter apply TREFLAN at 2.0 L/ha (0.81 L/ac) with SENCOR 500 at 550-850 mL/ha (223-344 mL/ac) or SENCOR 75DF at 375-550 g/ha (152-223 g/ac).
   (b) For fall application mix TREFLAN at 2.0 L/ha (0.81 L/ac) with SENCOR 500 at 550-700 mL/ha (223-283 mL/ac) or SENCOR 75 DF at 375-475 g/ha (152-192 g/ac) on light soils with less than 6% organic matter. On medium or heavy soils with 6-15% organic matter apply TREFLAN at 2.6 L/ha (1.10 L/ac) with SENCOR 500 at 700-850 mL/ha (283-344 mL/ac) or SENCOR 75 DF at 475-550 g/ha (192-223 g/ac).

NOTE: SENCOR rate varies with soil organic matter; the higher the organic matter the higher the rate of Sencor required. Refer to table below.

Note: Speeds in excess of 8 km/h (5 mph) will result in excessive pulverization and trash reduction leaving fields susceptible to erosion. The maximum recommended tillage depth for Saskatchewan is 10 cm (4 in.). Fall application is not recommended on soils where a lack of trash cover combined with the required incorporation could result in soil erosion.

% Organic Matter	**Spring**		**Fall**	
	Sencor 500	**Sencor 75DF**	**Sencor 500**	**Sencor 75DF**
2-3	425 mL/ha	275 g/ha	550 mL/ha	375 g/ha
3-6	550 mL/ha	375-440 g/ha	700 mL/ha	475 g/ha
6-10	550-850 mL/ha	400-550 g/ha	700-850 mL/ha	475-550 g/ha
10-15	850 mL/ha	550 g/ha	850 mL/ha	550 g/ha

On soils with 10% organic matter and higher, broadleaf control may not be adequate.

Always add Sencor to the spray tank first. Continuous agitation is required throughout the mixing and spraying operations. FOLLOW ALL LAND PREPARATION, MIXING, SPRAYING, INCORPORATION DIRECTIONS AND PRECAUTIONS AS OUTLINED ON THE SENCOR AND TREFLAN LABELS. THIS TANK-MIX IS FOR USE ONLY ON TRIAZINE TOLERANT CANOLA. NON-TRIAZINE TOLERANT CANOLA WILL BE KILLED BY THIS TANK MIX.

Triflurex 40 EC (trifluralin)

Activity: 400 g active ingredient/litre

Registered Uses: Crops	**Recommended Rates of Product**	
	Fall	**Spring**
Canola, sunflowers, peas mustard, fababeans	2.75-3.5 L/ha (1.11-1.40 L/ac)	2.0-2.75 L/ha (0.81-1.11 L/ac)
Barley, wheat		1.4-2.1 L/ha (0.57-0.85 L/ac)

Summer Application: Canola only - 4.25 L/ha (1.70 L/ac).

At 2.0-2.75 L/ha one 22.7 litre container treats 11.4-8.3 ha (28-20.4 ac).

Weeds Controlled: Wild oats, green and yellow foxtail, barnyard grass, wild buckwheat, cow cockle, redroot pigweed, lamb's-quarters, Russian thistle, chickweed, purslane, knotweed, Persian darnel.

Note: Rates recommended for barley and wheat will control green and yellow foxtail only.

Application and Timing:

1. Use the lower rate on light sandy soils or soils with less than 6% organic matter. Use the higher rate on heavier soils with higher organic matter.
2. Do not apply to peat or muck soils, wet soils, soils in poor working condition or soils which contain more than 15% organic matter.
3. Fields should be cultivated to destroy existing growth before applying Triflurex liquid. When applying to stubble fields, chop and thoroughly mix crop residues into the soil to a depth of 10 cm (4 in.). Disc type implements provide best results.
4. Apply in 100 L of water/ha (40 L/ac).

Spring - apply and incorporate immediately, in the same operation if possible. Do not delay incorporation more than 8 hours after application.

Fall - apply between September 1 and freeze-up. Incorporate immediately, in the same operation if possible. The second incorporation may be delayed until spring. If both incorporations are done in the fall, shallow tillage is required in the spring before planting.

Summer - apply and incorporate immediately, between June 1 and September 1. Do not delay incorporation more than 8 hours after application. Second and subsequent incorporations may be done any time prior to soil freeze-up.

Incorporation:

For Oilseed Crops

Incorporate immediately. The first incorporation is best done in combination with the application operation and should not be delayed more than 8 hours after application. Two operations at right angles are required. When applied in the fall, the second incorporation can be delayed until spring. When both incorporations are done in the fall, a shallow cultivation is required in the spring prior to planting.

Use a tandem disc, discer or vibrashank cultivator set to cut 7.5-10 cm (3-4 in.) deep. Operate disc implements at 7-10 km/h (4.3-6.2 mph) and cultivators at 8-10 km/h (5-6.2 mph). Rod-weeders, harrows or hoe-drills will not properly incorporate Triflurex.

For Cereals - Spring application only for control of green foxtail (wild millet) in wheat and barley.

1. Seed crop 5-7.5 cm (2-3 in.) deep.
2. Apply Triflurex as soon as possible after seeding. Fields with more than 25% trash cover should not receive this treatment.
3. Shallow incorporate with two passes of diamond or tine harrows at right angles to each other. Application and first incorporation should be done in the same operation if possible. The second incorporation must be completed within 8 hours of application.

Mode of Action:

Controls susceptible weeds by killing seedlings as they germinate. It does not control established weeds.

Precautions:

1. DO NOT use on oats, rye or forage grasses.
2. Wheat and barley will likely be injured if seeded through a treated layer or into a deeply incorporated layer of Triflurex.
3. DO NOT apply to peat or muck soils, wet soils, soils in poor working condition or soils which contain more then 15% organic matter.
4. Used as directed, and under normal conditions, Triflurex will not harm the treated crop. However, seedling disease, cold weather, deep planting, excessive moisture, high salt concentration or drought may weaken crop seedlings and increase the risk of damage resulting in delayed crop development or reduced yields.
5. If allowed to freeze, Triflurex liquid must be warmed to 15 C for 24 hours and shaken well before use.
6. Fall application is not recommended on soils where a lack of trash cover combined with the required incorporation could result in soil erosion.
7. There are no grazing restrictions.
8. Oats, canary seed and forage grasses should not be grown in rotation following a Triflurex treated crop.

Mixing:

1. Mix TRIFLUREX at 1.4 L/ha (0.57 L/ac) on light soils and 2.1 L/ha (0.85 L/ac) on medium to heavy soils with AVADEX BW (liquid formulation) at 3.5 L/ha (1.40 L/ac) in **wheat** or 3.5-4.25 L/ha (1.40-1.70 L/ac) in **barley** for control of wild oats and green foxtail (wild millet). Use only on fields free of trash. Apply in 100 L of water/ha (40 L/ac) after seeding and incorporate with a double harrowing at right angles. Seed should be placed 5-7.5 cm (2-3 in.) deep.

Note: Speeds in excess of 8 km/h (5 mph) will result in excessive pulverization and trash reduction leaving fields susceptible to erosion. The maximum recommended tillage depth for Saskatchewan is 10 cm (4 in.). Fall application is not recommended where a lack of trash cover combined with the required incorporation could result in soil erosion.

Tropotox Plus (MCPB + MCPA 15:1)

Note: This product is recommended for use on cereals underseeded to seedling clovers (except sweet clover).

Activity: 400 g active ingredient/litre

Registered Uses:

Crops	**Recommended Rates of Product**
Peas, wheat (spring, durum), barley, oats, rye, seedling clover (white, alsike, red), pastures	2.75-4.25 L/ha (1.10-1.70 L/ac)

At 2.75-4.25 L/ha two 8 litre containers treat 5.8-3.8 ha (14.4-9.3 ac).

Weeds controlled at 2.75 L/ha: Mustards (wild, ball, wormseed), stinkweed, lamb's- quarters.

Weeds controlled at 4.25 L/ha: Redroot pigweed, ragweed, shepherd's-purse, volunteer canola and suppression of hemp-nettle and annual sow-thistle. Top growth control of wild radish, bull thistle, Canada thistle, curled dock, plantains, perennial sow-thistle, field bindweed and horsetail.

Application and Timing:

1. Apply in 150-200 L of water/ha (60-80 L/ac) when the legumes are in the 1-4 true leaf stage and when the cereal is between the 2-leaf and flag leaf stages.
2. Apply when peas have 3-6 expanded leaves.
3. Apply in pastures after grazing or cutting when weeds are at a susceptible stage.

Mode of Action:

Mode of action is similar to 2,4-D and MCPA.

Precautions:

1. DO NOT use on sweet clover.
2. Rainfall before foliage has dried from spraying may decrease activity.
3. DO NOT freeze.
4. There are no grazing restrictions.

Mixing:

1. DO NOT mix TROPOTOX PLUS with any other pesticides, fertilizers or spray adjuvants.

2,4-D+, MCPA

Formulation:	**g active ingredient/litre**
2,4-D Low Volatile ester	600, 700, 500, 400
2,4-D, MCPA, amine, ester	500
MCPA sodium salt	300
MCPAK (potassium salt)	400

Registered Uses:

Crops	**Recommended Rates of Product**
Wheat (spring, durum), barley, rye	2,4-D[1] up to 1.1 L/ha (0.45 L/ac) MCPA[1] up to 1.25 L/ha (0.51 L/ac)
Flax, oats	MCPA[1] up to 1.1 L/ha (0.45 L/ac)
Peas	MCPA amine up to 0.56 L/ha (0.23 L/ac) MCPA sodium salt up to 0.70 L/ha (0.28 L/ac)
Winter Wheat	2,4-D[1] and MCPA[1] - up to 1.1 L/ha (0.45 L/ac)
Seedling forage grasses	2,4-D amine and MCPA - up to 1.1 L/ha (0.45 L/ac)
Established forage grasses	2,4-D[1] and MCPA - 2.2 L/ha (0.90 L/ac)
Native and Rangeland grasses	2,4-D[1] and MCPA - up to 4.4 L/ha (1.8 L/ac)

Weeds controlled by 2,4-D[1]:

0.56-0.84 L/ha **(0.23-0.34 L/ac)**	**0.84-1.1 L/ha** **(0.34-0.45 L/ac)**	**1.25-1.7 L/ha** **(0.51-0.69 L/ac)**
Lamb's-quarters, mustards (except dog and green tansy), ragweeds	burdock-seedlings cocklebur flixweed-fall rosettes - spring seedlings goat's-beard-seedlings kochia-2-4 leaf narrow-leaved hawk's-beard - fall rosette - spring seedlings plantain prickly lettuce Russian pigweed shepherd's-purse - fall rosettes - spring seedlings stinkweed - fall rosettes - spring seedlings annual sunflower sweet clover wild radish	alfalfa biennial wormwood** bluebur field peppergrass** flixweed-spring rosettes hairy galinsoga oakleaf goosefoot pineapple weed** prostrate amaranth purslane redroot pigweed Russian thistle shepherd's-purse - spring rosettes stinkweed - spring rosettes tumble pigweed annual sow-thistle blue lettuce* dandelion* docks* Canada thistle* field bindweed* hedge bindweed* hoary cress* perennial sow-thistle* Russian knapweed* leafy spurge*

+ Warning - Safety data and registration of 2,4-D is currently under review. To minimize exposure to 2,4-D, users should adopt protective measures by using proper protective equipment and good personal hygiene. This applies to all pesticides.

Weeds controlled by MCPA[1]:

0.7-1.1 L/ha (0.28-0.45 L/ac)

burdock
cocklebur
stinkweed
- spring seedlings
flixweed
- spring seedlings
kochia
lamb's-quarters
mustards (except dog and green tansy)
prickly lettuce
Russian pigweed
shepherd's-purse
- spring seedlings
annual sunflower
wild radish
ragweeds
field horsetail*
hoary cress*
plantain

1.25-1.7 L/ha (0.51-0.69 L/ac)

biennial wormwood
bluebur
dog mustard
field peppergrass
hairy galinsoga
hemp-nettle***
goat's-beard
oakleaf goosefoot
annual sow-thistle
sweet clover
tumble pigweed
Canada thistle*
dandelion*
docks*
field bindweed*
perennial sow-thistle*
redroot pigweed

* Top growth control only
** Controlled by 1.7 L/ha (0.69 L/ac) rate only
*** Suppression only

[1]These rates are for the amine formulations of 2,4-D and MCPA (500 active ingredient/litre). For rates of other formulations of 2,4-D and MCPA see conversion factors on page 73.

Application and Timing:

A. General

In cereals, apply in 100 L of water/ha (40 L/ac). In flax, use 100-165 L of water/ha (40- 65 L/ac).

B. Wheat (spring, durum), barley, rye

1. These crops can be sprayed safely from the 4-leaf stage up to just before the flag- leaf stage with rates of 2,4-D[1] up to 1.1 L/ha (0.45 L/ac) and MCPA[1] at .84-1.25 L/ha (0.34-0.51 L/ac). MCPA at rates of 0.70 L/ha (0.28 L/ac) and below can be applied after the 2-leaf stage of the crop.
2. Treatment at the 4-leaf stage will usually combine best crop tolerance and maximum weed susceptibility.
3. Treatment with 2,4-D ester before or during the 3-leaf stage in wheat or barley will likely cause leaf, stem and head deformities and may reduce yield up to 10%. If these crops must be treated before the 4-leaf stage, use the amine formulation of 2,4-D or MCPA.
4. Rates higher than those given in (1) may be necessary when the crop is heavily infested with semi-tolerant weeds. These higher rates may cause some crop injury particularly if 2,4-D ester is used. However, the injury may be more than offset by increased yield due to reduced weed competition. Use of an amine rather than an ester will reduce the risk of crop injury.

C. Oats

1. 2,4-D (especially the ester formulation) is not recommended on oats.
2. Oats can be treated safely with MCPA[1] at up to 1.1 L/ha (0.45 L/ac) from the 1-leaf stage up to just before the flag-leaf stage.
3. If 2,4-D must be used, apply the amine formulation at up to 0.98 L/ha (0.40 L/ac) from the 1-leaf to the 3-leaf stage or from the 6-leaf stage to just before the flag-leaf stage.
4. If heavy infestations of weeds resistant to 2,4-D or MCPA amines are present, use herbicides or mixtures containing Banvel or Torch DS/Pardner (bromoxynil) rather than 2,4- D ester.

D. Flax

1. 2,4-D is not recommended on flax. Use MCPA amine applied after the crop is 5 cm (2 in.) tall and before bud formation.
2. Rates of MCPA ester of 0.84 L/ha (0.34 L/ac) or more, MCPA amine of 0.98 L/ha (0.40 L/ac) or more or MCPA sodium salt of 1.9 L/ha (0.77 L/ac) or more will usually cause some delay in maturity. Any potential yield reductions should be offset by increased yields due to better weed control.

E. Peas

1. 2,4-D is NOT recommended on peas.
2. Treat when the vine length is less than 15 cm (6 in.) and peas are in the 2-5 leaf stage.
3. Use MCPA amine or sodium salt in 165-220 L water/ha (65-80 L/ac).
4. Phenoxy herbicides may cause maturity delays in peas.

F. Winter Wheat

1. Winter annuals may be sprayed in fall with rates of 2,4-D[1] or MCPA[1] from 0.84-1.1 L/ha

(0.34-0.45 L/ac). Use the higher rate for harder to kill weeds such as Canada thistle, perennial sow-thistle and narrow-leaved hawk's-beard. Crop injury may occur, however, the injury may be more than offset by increased yield due to reduced weed competition. CAUTION: This is not a registered treatment, any such use is entirely at the risk of the user.

2. In spring 2,4-D[1] or MCPA[1] can be sprayed up to 1.1 L/ha (0.45 L/ac) from the time the crop commences growth until just before the flag-leaf stage. Rates higher than 1.1 L/ha (0.45 L/ac) may be necessary for control of semi-tolerant weeds and over-wintered annuals. However, the crop injury may be more than offset by increased yield due to reduced weed competition. Use of an amine rather than an ester will reduce the risk of crop injury.

G. Forages grasses

1. Seedling grasses may be sprayed from the 3-leaf stage to just before the shot-blade stage. Apply in 100-165 L of water/ha (40-65 L/ac) in bromegrass, creeping red fescue, crested wheatgrass, intermediate wheatgrass and Russian wild ryegrass. Do not use 2,4-D ester.
2. Established grasses may be sprayed in the spring up to the shot-blade stage or in the fall after harvest. Apply in 100-165 L of water/ha (40-65 L/ac).

Mode of Action:

2,4-D and MCPA are translocated and cause rapid undifferentiated growth which usually results in death of susceptible plants.

Precautions:

1. Both the ester and amine formulations will cause floret sterility and severe yield losses if applied during the flag-leaf to fully headed stages of cereals.
2. DO NOT graze for 24 hours.
3. DO NOT graze dairy cattle for 7 days.
4. DO NOT apply ester formulations if rainfall is expected within 2 hours.
5. DO NOT apply amine formulations if rainfall is expected within 4 hours.
6. DO NOT apply Sodium or Potassium formulations of MCPA if rainfall is expected within 6 hours.
7. Not all brands of phenoxy herbicides are registered for the same uses. Refer to product labels for complete details.

Mixing:

1. Phenoxy herbicides may be tank-mixed with a number of other herbicides. Use mixtures only when they are registered and recommended for use. Insure that the proper formulation of phenoxy herbicide is used with the product considered for mixing.
2. ESTEMINE MCPA at 1.0 L/ha (0.40 L/ac) may be tank-mixed with 28-0-0 liquid fertilizer for spring application on winter wheat and fall rye. Apply early in spring when crop commences growth, until just before the flag-leaf stage. Consult fertilizer recommendations in regard to the most efficient method of applying nitrogen fertilizers.

Formulations	Risk of Vapor Drift	Activity on Weeds	Risk of Crop Injury	Risk of Rain Losses	Storage Requirements
Low Volatile Ester	Medium	Fast	Medium	Low	Can be frozen-warm and agitate
Amine	Very Low	Medium	Low	Medium	Do not freeze
Salts	Very Low	Slow	Very Low	High	Do not freeze

To convert from 500 g active ingredient/litre to other activities multiply by the following:

300 g active ingredient/litre - 1.67
400 g active ingredient/litre - 1.25
512 g active ingredient/litre - .98
600 g active ingredient/litre - .83
700 g active ingredient/litre - .71
800 g active ingredient/litre - .63

Plant Growth Regulators

Plant Growth Regulators (PGRs) are chemicals used to alter the growth of a plant in some manner. They are classified as pesticides and are regulated by the same legislation that applies to herbicides, insecticides and fungicides. Therefore, they must be registered under the Pest Control Products Act before they can be legally sold in Canada. The only PGR available for sale in Western Canada is ethephon (Cerone). It is registered for use as an anti-lodging agent in Bedford, Bonanza, Galt and Johnston barley. Use of an anti-lodging agent such as Cerone should be considered only in fields of these varieties which have a high yield potential and a high potential for lodging.

In Saskatchewan, barley crops being produced in the parkland area and in irrigated areas where maximum yields are being attempted are the most likely to require an anti-lodging agent. Crop varieties vary significantly in their ability to withstand lodging and this should also be taken into account when selecting varieties for use in high yield management programs.

Cerone (ethephon)

Activity: 480 g active ingredient/litre

Registered Uses:

Crops	**Recommended Rates of Product**
Barley (Bedford, Bonanza, Galt and Johnston varieties only)	0.5-0.83 L/ha (0.20-0.33 L/ac)

At 0.5-0.83 L/ha one 5 litre container treats 6-10 ha (15-25 acres).

Control: Cerone will reduce lodging in barley.

Application:

1. Thorough and uniform coverage of upper leaves is essential for optimal results.
2. Apply in 110 L of water/ha (45 L/ac) when using ground sprayers. Be certain the boom is high enough above the crop canopy to give proper coverage.
3. For aerial applications, apply 50 L of water/ha (20 L/ac) or more.
4. Adjust rates according to environmental and growth conditions. Use the higher rates on crops that are highly fertilized, have ample moisture, and are prone to lodging. Use the lower rates of Cerone unless lodging conditions are expected to be severe.

Timing:

1. Correct timing is essential for successful results and to ensure crops safety.
2. Apply after the flag leaf has begun to emerge until the swollen-boot stage (Zadok's growth stages 37-45). Do not apply once awns begin to show. Consult Cerone label for staging details.

Mode of Action:

1. The activity of Cerone is primarily through contact action. Thorough spray coverage is essential for satisfactory results.
2. Cerone reduces lodging by reducing the extension of the upper internodes of the plant. Cerone will typically reduce the height by 2-15 cm (1-6 in.). It will also reduce necking and increase straw strength.
3. Under certain conditions, a delay in crop maturity may occur. This is normally not greater than 5 days and is generally less than that caused by lodging.

Precautions:

1. DO NOT apply to crops which are under any type of stress such as drought, excessive moisture, excessive heat, disease or crops which have already lodged. Applications to stressed crops may result in severe yield reductions.
2. DO NOT apply if rainfall is expected within 5 hours.
3. DO NOT allow mixed solution to stand overnight.
4. DO NOT apply within 35 days of harvest.
5. Clean spray equipment thoroughly immediately after spraying. Cerone spray deposits, when left on aircraft acrylic plastic type windshields may react forming an opaque film or spots. Rinse windshields with water immediately after each tankload of Cerone has been applied.
6. Treated straw may be fed to livestock.

Mixing:

DO NOT mix CERONE with any other pesticides, surfactants or wetting agents.

Herbicide Tank Mixes

	Banvel	Bladex TTC	Buctril M	Embutox	Estaprop	Glean	Lontrel	MCPA amine	MCPA ester	MCPA K or NA+	Pardner/Torch DS	Rival	Sabre, Bromox 720 M	Sencor 500	Target	Treflan	Triflurex	2,4-D amine	2,4-D ester
Afolan, Lorox								•							•				
Amiben																•			
Asulox F			•																
Avadex BW												•				•	•		
Avenge 200-C			•	•	•	•			•		•		•						•
Banvel								•		•				•				•	
Basafapon, Dowpon								•		•									
Hoe-Grass						•	•				•								
Lexone	•							•								•			
Mataven						•													
TCA			•					•	•	•								•	
Pardner								•	•	•								•	•
Poast		•	•				•	•	•				•						
Sencor 500	•							•							•	•		•	
Sencor 75 DF	•							•								•		•	
Stampede 360						•			•									•	•
Torch DS								•	•	•								•	•

• Tank mixes registered and recommended for use. Herbicide mixtures can be used to advantage where weed infestations are composed of a mixture of weeds with varying susceptibilities to any one herbicide or where grassy and broadleaf weeds are present. **Use mixtures only when they are registered and recommended for use.** Other mixtures may not be effective, may injure the crop or may leave a harmful residue in the treated crop. In many cases an interval of a specified time must occur between the application of two different products either to avoid the risk of reduced weed control or increased crop injury. The above chart summarizes the situation with respect to tank-mixing of herbicides for use in field crops. **Consult specific product sections or product labels for details on crops or crop varieties that these mixes may be applied on. Note: Tank-mix instructions may not appear on both product labels.**

Herbicides For Use In Forage Crops

Herbicide	Seedling Grass											Seedling Legume					Est. Grass			Established Legume					Cover Crop			
Consult the label for final detailed instructions	Bromegrass	Creeping Red Fescue	Crested Wheatgrass	Inter. Wheatgrass	Kentucky Bluegrass	Meadow Fescue	Orchardgrass	Reed Canarygrass	Russian Wild Ryegrass	Slender Wheatgrass	Timothy	Alfalfa	Alsike Clover	Red Clover	Sweetclover	White Clover	Grasses	Bromegrass	Russian Wild Ryegrass	Alfalfa	Alsike Clover	Birsdfoot Trefoil	Red Clover	Sweetclover	Barley	Flax	Oats	Wheat
Asulox F												X[1]								X[1]						X		
Avadex BW												X[2]	X[2]	X[2]	X[2]	X[2]									X	X		X
Avenge 200-C	X[2]	X[2]	X[2]		X[2]	X[2]	X[2]	X[2]	X[2]		X[2]	X[2]		X[2]	X[2]										X			X[3]
Basafapon/Dowpon												X														X		
Buctril-M	X[4]	X[4]	X[4]	X[4]		X[4]	X[4]	X[4]	X[4]	X[4]	X[4]														X	X	X	X
Cobutox/Embutox/ Butyric 400												X	X	X		X				X					X		X	X
Eptam 8E												X																
Hoe-Grass	X[5]	X[5]	X[5]	X[5]					X[5]			X[5]		X[5]	X[5]										X	X		X
Kerb 50W																	X[8]	X[8]	X[8]	X[6]		X[6]						
Mataven/Mataven L	X[4]	X[4]	X[4]	X[4]		X[4]			X[4]			X[4]		X[4]														X
MCPA	X	X	X	X					X								X	X	X						X	X	X	X
Pardner	X[4]	X[4]	X[4]	X[4]		X[4]	X[4]	X[4]	X[4]	X[4]	X[4]									X[6]		X[6]			X	X	X	X
Princep																						X[6]						
Simazine 80W																						X[6]						
Sinbar																				X[6]		X[6]						
Torch DS	X[4]	X[4]	X[4]	X[4]		X[4]	X[4]	X[4]	X[4]	X[4]	X[4]																	
Tropotox Plus												X	X	X		X									X		X	X
2,4-D	X[7]	X[7]	X[7]	X[7]					X[7]								X[7]	X[7]	X[7]						X			X

X — Product is recommended for the crop.

1. For seed production only.
2. Do not graze or feed during the year of establishment. Use only when forage seedlings are underseeded in crops for which herbicide is registered.
3. Neepawa, Glenlea, Chester, Selkirk, Macoun, Canuck, Benito, Columbus, Leader, Katepwa, HY320.
4. For seed production only, only in year of establishment.
5. Use in year of establishment only. Do not use Forage For Feed.
6. Pure stand only. Low rates of Kerb 50W may be used on mixed stands.
7. Use 2,4-D amine only.
8. For Forage use only.

Weed Control in Forages

Tame Forages - Refer to the chart on the previous page to determine the herbicides that can be used on your forage crop. Then refer to the appropriate product page for information on the use of the product(s) which can be used in your situation.

Pasture Renovation - Apply Roundup to control or suppress existing vegetation for zero-tillage seeding of legumes into established sod for pasture renovation in the black soil zone. Delay spraying until the existing vegetation is at least 20 cm (8 in.) in height and the maximum number of shoots have emerged. Application can be made immediately before, during or after seeding but before crop emergence. Refer to the Roundup label for rates of application required for the control of specific weeds.

Rangeland and Native Pastures - The carrying capacity and quality of forage on range or native pasture can be increased by controlling weeds. The use of herbicides is justified when used in combination with proper grazing practices, where the control or reduction of undesirable weeds results in an economic increase of desirable forage.

General Considerations

Unless specified otherwise, brush control herbicides should be applied during June. Optimum time to spray occurs after the leaf blade has fully expanded. As the growing season progresses, leaves develop a thicker cuticle (outer cell layer on a leaf) which impede the entry of herbicides into the leaves. Thicker cuticles develop under high temperatures and low relative humidity. The lower the relative humidity, the more rapid the drying rate of a herbicide drop on a leaf. This reduces the amount of time for a herbicide to penetrate a leaf which reduces the effectiveness of a herbicide. **NOTE:** Brush taller than 2 m (6 ft.) should be cut and the regrowth sprayed.

Most broadleaf plants are easier to kill with 2,4-D type herbicides during a period of rapid growth. Often control is less effective during hot dry weather when there is a soil moisture deficit. Because growing and environmental conditions vary from year to year, the effectiveness of a herbicide application varies. Often a single spray application will not control perennial rangeland weeds. Herbicide treated areas must be observed after spraying each year for regrowth. Depending on the amount of regrowth, one to several retreatments may be required. For most range weeds, control depends upon adequate competition from established grasses. Legumes will be damaged or killed by the treatments listed for brush and perennial weed control. Because there is a possibility that plants poisonous to livestock may be grazed more readily after 2,4-D treatment, suitable precautions should be taken when such plants are present. For grazing and feeding restrictions of individual products refer to the table of page 94. For further information on rangeland weed control, refer to the Weed Control Section of the Guide to Farm Practice in Saskatchewan. Refer to product labels for precautions, grazing restrictions, general use information and specific application instructions before using product. NOTE: Not all brands of 2,4-D are registered for the same uses.

Select the type of herbicide application which best fits your weed problem. The herbicide application types are:

1. **Foliage Treatment:** Apply herbicide(s) in 110 to 220 L water/ha (45 to 90 L/ac) with ground sprayers and at 35 L of water or oil/ha (15 L/ac) with an aircraft to foliage when leaves are fully expanded.
2. **Stem-Foliage Treatment:** Apply herbicide(s) to foliage and stem to the point of run-off. The rate of herbicides specified is usually added to 1000 L of water. Volume of spray mixture applied per hectare will vary according to height and density of brush.
3. **Spot Treatment:** For spot control, herbicides should be applied in sufficient water for uniform and complete coverage, however, do not spray to the point of run-off. Amitrol-T and Roundup are non-selective herbicides and will kill desirable vegetation. Banvel 10G should be applied evenly on the weed infested area. The land area of a spot treatment for Banvel 10G should not exceed 0.5 ha (1.2 ac) and all treated spots in a field should not exceed 2.5% of the total land area in a field in any one year. Tordon 22K is highly potent, persistent and water soluble. It may be used for spot treatment when applied by a licenced pesticide applicator. The land area of a spot treatment for Tordon 22K should not exceed 5% of the total land area in a field in any one year. Spot treatment with Banvel 10G or Tordon 22K may temporarily stunt the growth of desirable grasses. NOTE: 100 square metres (sq.m.) is equal to 1076 square feet.

Herbicides for Rangeland and Native Pastures

Weed Species	Treatment	Herbicide (recommended rate of product) [1]
Absinth	Foliage	2,4-D LV ester 500 4.4 L/ha (1.82 L/ac) [2]
	Spot	Roundup 75-125 mL in 5.0 L water per 100 sq. m. (1076 sq. ft.)
Alders	Foliage	2,4-D LV ester 500 4.4 L/ha (1.82 L/ac)
	Stem-Foliage	Banvel LH (400 g/L) 2.5 L + 2,4-D LV ester 500 or amine 500 4.0 L Banvel (480 g/L) 2.1 L + 2,4-D LV ester 500 or amine 500 4.0 L
Trembling Aspen (Aspen Poplar)	Foliage	Banvel LH (400 g/L) 3.75 L/ha (1.52 L/ac) + 2,4-D LV ester 500 or amine 500 4.4 L/ha (1.82 L/ac) Banvel (480 g/L) 3.25 L/ha (1.32 L/ha) + 2,4-D LV ester 500 or amine 500 4.4 L/ha (1.82 L/ac)
	Foliage	2,4-D LV ester 500 4.4 L/ha (1.82 L/ac)
	Stem-Foliage	Banvel LH (400 g/L) 2.5 L + 2,4-D LV ester 500 amine 500 4.0 L Banvel (480 g/L) 2.1 L + 2,4-D LV ester 500 or amine 500 4.0 L
	Stem-Foliage	Roundup 1 L in 100 L of water
Biennial Wormwood	Foliage	2,4-D LV ester 500 4.4 L/ha (1.82 L/ac) [2]
Balsam Poplar	Stem-Foliage	Banvel LH (400 g/L) 2.5 L + 2,4-D LV ester 500 or amine 500 4.0 L Banvel (480 g/L) 2.1 L + 2,4-D LV ester 500 or amine 500 4.0 L
	Stem-Foliage	Roundup 1 L in 100 L of water
Canada thistle	Foliage	2,4-D LV ester 500 2.2 to 4.4 L/ha (0.90-1.82 L/ac) Banvel LH (400 g/L) 2.5 L/ha (1.0 L/ac) Banvel (480 g/L) 2.1 L/ha (0.85 L/ac) Banvel LH (400 g/L) 2.5 L/ha (1.0 L/ac) + 2,4-D LV ester 500 or amine 500 2.2 L/ha (0.9 L/ac) Banvel (480 g/L) 2.1 L/ha (0.85 L/ac) + 2,4-D LV ester 500 or amine 500 2.2 L/ha (0.9 L/ac)
	Spot	Amitrol-T 375 mL in 25 L of water per 100 sq. m. (1076 sq. ft.) Banvel 10G 56 kg/ha (22.7 kg/ac) [6] Roundup 50-70 mL in 5.0 L water per 100 sq. m. (1076 sq. ft.) Tordon 22K 45 mL in 18 L of water per 100 sq. m. (1076 sq. ft.)
Chokecherry	Foliage	2,4-D LV ester 500 4.4 L/ha (1.82 L/ac)
Curled Dock	Spot	Roundup 75-125 mL in 5.0 L water per 100 sq. m. (1076 sq. ft.)

Diffuse Knapweed	Spot	Banvel LH (400 g/L) 5.5 L/ha (2.23 L/ac) Banvel (480 g/L) 4.6 L/ha (1.86 L/ac) Tordon 22K 22 mL in 18 L of water per 100 sq. m. (1076 sq. ft.)
Field Bindweed	Foliage	2,4-D LV ester 500 2.2 to 4.4 L/ha (0.9-1.82 L/ac) Banvel LH (400 g/L) 2.5 L/ha (1.0 L/ac) Banvel (480 g/L) 2.1 L/ha (0.85 L/ac) Banvel LH (400 g/L) 2.5 L/ha (1.0 L/ac) + 2,4-D LV ester 500 or amine 500 2.2 L/ha (0.9 L/ac) Banvel (480 g/L) 2.1 L/ha (0.85 L/ac) + 2,4-D LV ester 500 or amine 500 2.2 L/ha (0.9 L/ac)
	Spot	Banvel 10G 56 kg/ha (22.7 kg/ac) [7] Roundup 75-125 mL in 5.0 L water per 100 sq. m. (1076 sq. ft.) Tordon 22K 90 mL in 18 L of water per 100 sq. m. (1076 sq. ft.)
Gumweed	Foliage	2,4-D LV ester 500 2.2 L/ha (0.9 L/ac)
Hoary Cress	Spot	Amitrol-T 375 mL in 25 L of water per 100 sq. m. (1076 sq. ft.) Roundup 75-125 mL in 5.0 L water per 100 sq. m. (1076 sq. ft.)
Leafy Spurge	Foliage Spot	2,4-D LV ester 500 2.2 L/ha (0.9 L/ac) [3] Tordon 22K 90 mL in 18 L of water per 100 sq. m. (1076 sq. ft.)
Locoweeds	Foliage	2,4-D LV ester 500 4.4 to 6.8 L/ha (1.82-2.75 L/ac) [4]
Lupines	Foliage	2,4-D LV ester 500 4.4 to 6.8 L/ha (1.82-2.75 L/ac) [4]
Milk-vetches	Foliage	2,4-D LV ester 500 4.4 to 6.8 L/ha (1.82-2.75 L/ac) [5]
Milkweeds	Spot	Amitrol-T 375 mL in 25 L of water per 100 sq.m. (1076 sq. ft.)
Pasture Sage	Foliage Spot	2,4-D LV ester 500 4.4 L/ha (1.82 L/ac) [2] Banvel LH (400 g/L) 5.5 L/ha (2.23 L/ac) Banvel (480 g/L) 4.6 L/ha (1.86 L/ac) Tordon 22K 45 mL in 18 L of water per 100 sq. m. (1076 sq. ft.)
Perennial Sow-Thistle	Foliage	2,4-D LV ester 500 2.2 to 4.4 L/ha (0.9-1.82 L/ac) Banvel LH (400 g/L) 2.5 L/ha (1.0 L/ac) Banvel (480 g/L) 2.1 L/ha (0.85 L/ac) Banvel LH (400 g/L) 2.5 L/ha (1.0 L/ac) + 2.4-D LV ester 500 or amine 500 2.2 L/ha (0.9 L/ac) Banvel (480 g/L) 2.1 L/ha (0.85 L/ac) + 2,4-D LV ester 500 or amine 500 2.2 L/ha (0.9 L/ac)
	Spot	Amitrol-T 375 mL in 25 L of water per 100 sq. m. (1076 sq. ft.) Roundup 75-125 mL in 5.0 L water per 100 sq. m. (1076 sq. ft.) Tordon 22K 45 mL in 18 L of water per 100 sq. m. (1076 sq. ft.)

Poverty Weed	Foliage Spot	2,4-D LV ester 500 4.4 L/ha (1.82 L/ac) [2] Banvel LH (400 g/L) 5.5 L/ha (2.23 L/ac) Banvel (480 g/L) 4.6 L/ha (1.86 L/ac) Tordon 22K 45 mL in 18 L of water per 100 sq. m. (1076 sq. ft.)
Prairie Everlasting	Foliage	2,4-D LV ester 500 4.4 L/ha (1.82 L/ac) [2]
Prairie Sage	Foliage	2,4-D LV ester 500 4.4 L/ha (1.82 L/ac) [2]
Russian Knapweed	Spot	Tordon 22K 45 mL in 18 L of water per 100 sq. m. (1076 sq. ft.)
Saskatoon	Foliage	2,4-D LV ester 500 4.4 L/ha (1.82 L/ac)
Scentless Chamomile	Spot	Tordon 22K 11 mL in 18 L of water per 100 sq. m. (1076 sq. ft.)
Toadflax	Spot	Amitrol-T 375 mL in 25 L of water per 100 sq. m. (1076 sq. ft.) Roundup 75-125 mL in 5.0 L water per 100 sq. m. (1076 sq. ft.) Tordon 22K 45 mL in 18 L of water per 100 sq. m. (1076 sq. ft.)
Western Snowberry (buckbrush)	Foliage Stem-Foliage Stem-Foliage	2,4-D LV ester 500 4.4 L/ha (1.82 L/ac) Banvel LH (400 g/L) 4.35 L/ha (1.76 L/ac) + 2,4-D LV ester 500 4.4 L/ha (1.82 L/ac) Banvel (480 g/L) 3.65 L/ha (1.48 L/ac) + 2,4-D LV ester 500 4.4 L/ha (1.82 L/ac) Banvel LH (400 g/L) 2.5 L + 2,4-D LV ester 500 or amine 500 4.0 L Banvel (480 g/L) 2.1 L + 2,4-D LV ester 500 or amine 500 4.0 L Roundup 1 L in 100 L of water
Roses	Foliage Stem-Foliage 	Banvel LH (400 g/L) 4.35 L/ha (1.76 L/ac) + 2,4-D LV ester 500 or amine 500 4.4 L/ha (1.82 L/ac) Banvel (480 g/L) 3.65 L/ha (1.48 L/ac) + 2,4-D LV ester 500 or amine 500 4.4 L/ha (1.82 L/ac) Banvel (400 g/L) 2.5 L + 2,4-D LV ester 500 or amine 500 4.0 L Banvel (480 g/L) 2.1 L + 2,4-D LV ester 500 or amine 500 4.0 L
Willows	Foliage Stem-Foliage	2,4-D LV ester 500 4.4 L/ha (1.82 L/ac) Roundup 1 L in 100 L of water
Silverberry (wolf willow)	Stem-Foliage	Banvel LH (400 g/L) 2.5 L + 2,4-D LV ester 500 or amine 500 4.0 L Banvel (480 g/L) 2.1 L + 2,4-D LV ester 500 or amine 500 4.0 L

(1) Rates given for 2,4-D are for the 500 g active ingredient/litre formulation. For rates of other formulations see conversion factors on page 73.
(2) Apply in early fall and repeat in spring.
(3) Apply in the early bud stage and retreat the same year if regrowth is sufficient. Yearly retreatment will be required.
(4) Apply in full bloom stage of growth.
(5) Apply between 13 cm stage and before full bloom.
(6) Apply pre-bud stage.
(7) Apply pre-bloom stage.

Fall Weed Control

A. Post-emergence Herbicides

Fall weed control is an extremely important part of any tillage system. If winter annuals are not controlled in the fall or early spring, they mature beyond the susceptible period and cause substantial moisture and nutrient loss. Perennial weed control should be done in the fall to minimize crop competition losses in the spring, provided the following conditions are met: There is adequate moisture to promote new active growth of the weeds and killing frost is not likely to occur within two weeks of application. Good growing conditions for at least two weeks following treatment are required for best results.

1. Winter Annuals

a. Summerfallow/Stubble

Stinkweed, flixweed, shepherd's-purse-Apply 2,4-D[1] or MCPA[1] at 0.84-1.1 L product/ha (0.34-0.45 L/ac). This treatment should be applied in 100 L of water/ha (40 L/ac) to emerged weeds prior to freeze-up.

b. Alfalfa

Narrow-leaved hawk's-beard, stinkweed, flixweed - Apply Embutox 625 or 2,4D Butyric 400 or Cobutox to alfalfa when weeds are in the seedling rosette stage. Apply in 220 L of water/ha (90 L/ac) after the alfalfa has stopped growth but before freeze-up.

c. Winter Wheat

Winter annuals may be sprayed with rates of 2,4-D[1] or MCPA[1] from 0.84-1.1 L/ha (0.34-0.45 L/ac). Use the higher rate for harder to kill weeds such as Canada Thistle, perennial sow-thistle and narrow-leaved hawk's-beard. Crop injury may occur, however, the injury may be more than offset by increased yield due to reduced weed competition. **CAUTION:** This is not a registered treatment, any such use is entirely at the risk of the user.

OR

Buctril-M (560) at 1.0 L product/ha (0.40 L/ac) when the winter wheat is in the 2-4 leaf stage to control stinkweed, flixweed and shepherd's purse.

2. Canada Thistle - Perennial Sow-Thistle

Apply 2,4-D[1] or MCPA[1] at 2.2 L product/ha (0.90 L/ac) OR Estaprop at 1.9 L product/ha (0.77 L/ac) OR Kilmor at 1.7 L product/ha (0.69 L/ac), after harvest in 100 L water/ha (40 L/ac). Allow two or three weeks after treatment before working the soil.

OR

Apply Amitrol-T at 22-25 L product/ha (8.9-10.0 L/ac) in at least 200 L water/ha (80 L/ac) (spot treatment) to actively growing plants that are 15-20 cm (6-8 in.) tall. Follow with tillage in 2-3 weeks. Do not apply after October 1.

OR

Apply Banvel LH (400 g/L) at 1.5 L product/ha (0.61 L/ac) or Banvel (480 g/L) at 1.25 L product/ha (0.51 L/ac) tank-mixed with 2,4-D amine at 1.1-2.2 L product/ha (0.45-0.90 L/ac) in 100 L of water/ha (40 L/ac) OR Banvel LH (400 g/L) alone at 3.0 L product/ha (1.20 L/ac) or Banvel (480 g/L) alone, at 2.5 L product/ha (1.0 L/ac) in at least 100 L water/ha (40 L/ac). Apply Banvel treatments when plants are actively growing and follow with tillage in 2-3 weeks. The use of Banvel at these rates after September 1 may result in residue carry-over that will damage the following crop. Plant only cereal crops the year after treatment.

OR

Apply Banvel LH (400 g/L) at 1.5 L product/ha (0.61 L/ac) or Banvel (480 g/L) at 1.25 L product/ha (0.5l L/ac), tank-mixed with Roundup at 1.7 L product/ha (0.69 L/ac) plus 350 mL/ha (141 mL/ac) of a non-ionic surfactant in at least 100 L water/ha (40 L/ac) when plants are actively growing and follow with tillage in 2-3 weeks. The use of Banvel at these rates after September 1 may result in residue carry-over that will damage the following crop. Plant only cereals, field corn, sweet corn or canola crops the year after treatment.

OR

Apply Roundup at 4.7-7.0 L product/ha (1.9-2.8 L/ac) in at least 100 L of water/ha (40 L/ac) (spot treatment) to actively growing plants that are 20-25 cm tall (8-10 in.). Hard frost shortly before or after application will greatly reduce the effectiveness of this treatment.

Note: None of the above listed treatments used alone will give complete control of Canada Thistle and Perennial Sow-Thistle. Control of these perennial weeds requires combined program of treatment in the crop and in the stubble after harvest or on the summerfallow.

[1]The rates given are for the amine formulations of 2,4-D or MCPA (500 g active ingredient/litre For rates of other formulations of 2,4-D MCPA. See conversion table page 73.

3. Quackgrass

One Season Control: Apply Roundup at 2.5 L product/ha (1.0 L/ac) after harvest in the fall in annual cropping systems. Apply in 50-100 litres of clean water/ha (20-40 L/ac) using flat fan nozzles. Spray when most quackgrass is at least 20 cm (8 in.) in height (3 to 4 leaf stage of growth), and actively growing. If quackgrass is sodbound, reduced control will result. If a frost has occurred, wait several days to determine if the quackgrass has recovered. Quackgrass can be treated after a mild frost provided there are 3 to 4 green leaves actively growing at the time of application. Do not apply after the first damaging frost in the fall. Do not till between harvest and fall application. Allow 7 or more days after application before tillage.

Long Term Control: Apply Roundup at 4.7-7.0 L product/ha (1.9-2.8 L/ac). Apply in 50-100 litres of clean water/ha (20-40 L/ac) using flat fan nozzles. Spray when most quackgrass is at least 20 cm (8 in.) in height (3 to 4 leaf stage of growth), and actively growing. If a frost has occurred, wait several days to determine if the quackgrass has recovered. Quackgrass can be treated after a mild frost provided there are 3 or 4 green leaves actively growing at the time of application. Do not apply after the first damaging frost in the fall. Do not till between harvest and fall application before tillage. Allow 7 or more days after application before tillage.

B. Pre-emergence Herbicides

Glean: For use prior to seeding wheat (excluding durum). See page 32.

C. Soil Incorporated Herbicides

Fall application of incorporated herbicides can result in less drying of the seedbed than spring applications. However, product selection and use should be determined on the basis of local soil and weather conditions. To reduce the risk of soil erosion use the minimum amount of tillage required for satisfactory incorporation of fall applied products. Where possible complete the incorporation procedures in the spring. Conserve trash cover on summerfallow. Granular formulations can be used under trashy conditions. Where the required incorporation will result in excessive trash destruction or soil pulverization do not use the product in the fall.

Avadex BW (liquid or granular): For use in wheat, barley, flax, canola and mustard. See page 13.
Fortress (granular): For use in wheat, barley, flax, canola and mustard. See page 30.
Heritage 5G (granular): For use in wheat. See page 34.
Rival EC (liquid) or Rival 10G (granular): For use in canola, sunflowers, peas, mustard, fababeans, flax and lentils. See page 50.
Treflan EC (liquid) or Treflan QR5 (granular): For use in canola, sunflowers, peas, mustard, barley, fababeans, flax and lentils. See page 65.
Triflurex 40 EC (liquid): For use in canola, sunflowers, peas, mustard and fababeans. See page 68.

Zero-Tillage Spring Treatment

Weed control before crop emergence is essential to successful crop production in a zero- tillage program. All existing weed and volunteer crop growth should be destroyed shortly before crop emergence.

Wheat, Barley, Oats: Apply Roundup at 1.2 L product/ha (0.49 L/ac) tank-mixed with 350 mL/ha (140 mL/ac) of a non-ionic surfactant (e.g. Agral 90, Ag Surf, Triton XR) in 100 L water/ha (40 L/ac) to control wild oats, green foxtail, volunteer cereals and wild mustard. If wild buckwheat, lady's-thumb or lamb's-quarters are present add Pardner at 1.0 L product/ha (0.40 L/ac) or Torch DS at 625 mL product/ha (253 mL/ac) to the tank-mix. Note: Do not apply Roundup after crop emergence.

Forage Legumes and Grasses: Apply Roundup in 100 to 300 litres of clean water/ha (40-120 L/ac) to control emerged vegetation prior to emergence of forage legume and grass seedlings. If legumes and grasses are to be underseeded with a cover crop, Roundup must be applied prior to planting a labelled cover crop. Apply at the recommended label rates and stage of weed growth. Tillage such as fall plowing, spring plowing, discing or mowing prior to application will reduce effectiveness on perennial weeds.

Quackgrass (One Season Control): Apply Roundup at 2.5 L product/ha (1.0 L/ac) in spring prior to planting. Apply in 50-100 litres of clean water/ha (20-40 L/ac) using flat fan nozzles. Spray when most quackgrass is at least 20 cm (8 in.) in height (3 to 4 leaf stage of growth), and actively growing. If quackgrass is sodbound, reduced control will result. Quackgrass can be treated after a mild frost provided there are 3 to 4 leaves actively growing at the time of application. Allow 7 or more days after application before tillage.

Chemical Fallow or Minimum Tillage Fallow Treatments

In the brown and dark brown soil zones, Glean may be applied at 30 g product/ha in the fall or spring to fallow land for the control of certain broadleaf weeds. For adequate results, pre-emergence to weeds, sufficient rainfall is required to move Glean into the germinating weed root zone before weeds develop an established root system and grow beyond the seedling stage. For best post-emergence results apply Glean with a surfactant to small (less than 10 cm tall (4 in.)) actively growing weeds. If weeds are beyond the recommended growth stage at application, or if weeds germinate and grow prior to sufficient rainfall activation of Glean, a shallow cultivation is recommended. Refer to the Minimum Recropping Interval and Rotation Guidelines prior to using. No more than 30 g/ha of Glean should be applied per fallow period. For control of certain grassy weeds Glean at 30 g/ha may be tank-mixed with Roundup at 0.75-1.0 L product/ha (0.3-0.4 L/ac) mixed with 350 mL/ha (140 mL/ac) of non-ionic surfactant (eg. Agral 90, Ag Surf, Triton XR) in the spring to small actively growing weeds. Ensure that Glean is completely in suspension in the spray tank before adding Roundup. Note: Seed only wheat the year following the fallow period.

OR

Apply Roundup at 0.75-1.0 L product/ha (0.3-0.4 L/ac) mixed with 350 mL/ha (140 mL/ac) of non-ionic surfactant (eg. Agral 90, Ag Surf, Triton XR) in 50-100 L of clean water/ha (20- 40 L/ac) to control wild oats, green foxtail, volunteer cereals and wild mustard. The higher rate of application should be used when weeds are beyond 8 cm (3 in.) in height and/or when heavy weed infestations are present. For control of certain additional broadleaf weeds Roundup at the recommended rates may be tank-mixed with Banvel LH (400 g/L) at 350 mL/ha** (142 mL/ac) OR Banvel (480 g/L) at 290 mL/ha** (117 mL/ac) OR Pardner (280 g/L) at 1.0 L/ha (0.40 L/ac) OR Torch DS at 625 mL/ha (253 mL/ac) OR 2,4-D amine (500 g active ingredient/litre) at 0.70 L/ha (0.28 L/ac), plus 350 mL/ha (142 mL/ac) of a non- ionic surfactant (eg. Agral 90, Ag Surf, Triton XR). For weeds controlled by any specific tank-mix refer to the Roundup label. Reduced results may occur if applications of Roundup alone or in tank mixtures are made to weeds which are not actively growing, drought stressed or beyond 15 cm (6 in.) in height.

**For control of wild buckwheat apply Banvel LH (400 g/L) at 700 mL/ha (283 mL/ac) or Banvel H (480 g/L) at 600 mL/ha (243 mL/ac).

Roundup does not provide residual weed control. Repeat treatments may be necessary. Apply Roundup with ground equipment only, avoid drift to prevent injuring valuable vegetation. Thoroughly wash equipment after spraying, do not contaminate water sources by disposal of wastes or cleaning of equipment. Do not use Roundup in galvanized spray equipment.

OR

Apply Sweep* at 2.25 L/ha (0.91 L/ac) in 100 L water/ha (40 L/ac) when annual grasses are in the 2-4 leaf stage. In most seasons, 2 applications will be required for annual grass control, one in late May or early June and another in late July or early August. In some seasons, 3 applications may be required for season long control. If broadleaf weeds such as wild buckwheat or other hard to kill broadleaf weeds are present at the time of application or between applications of Sweep, apply a recommended broadleaf weed killer such as 2,4-D, MCPA, Torch DS, Pardner, Banvel or Afolan F or Lorox L plus MCPA either as a tank-mix with Sweep or as a separate application at the recommended rate for each specific product. Afolan or Lorox should only be applied once per season and only in the spring.

Use clear water for applying Sweep and apply with ground equipment only. Applications on cloudy days or just before darkness will generally increase the effectiveness of the treatment. Avoid drift onto nearby valuable vegetation. Thoroughly wash equipment after spraying. Use a detergent at 30 mL/60 L of water, circulate and spray out, then rinse with clean water. When possible, fill sprayer with clean water and let stand overnight before draining.

*Warning - "Safety data and registration of these products are under review. Directions for use and cautionary statements should be carefully followed. Read the label before using."

Perennial Weed Control

1. Spot Treatment in Summerfallow

Canada Thistle - Perennial Sow-Thistle

Cultivate in spring and allow thistles to grow to the early bud stage (15-25 cm (6-10 in.) tall) and apply;

a) Banvel LH (400 g/L) at 3.0 L product/ha (1.20 L/ac) or Banvel (480 g/L) at 2.5 L product/ha (1.0 L/ac); or

b) Banvel LH (400 g/L) at 1.5 L product/ha (0.61 L/ac) or Banvel (480 g/L) at 1.25 L/ha (0.51 L/ac) with 2,4-D amine at 2.2 L product/ha (0.90 L/ac); or

c) Banvel LH (400 g/L) at 1.5 L product/ha (0.61 L/ac) or Banvel (480 g/L) at 1.25 L product/ha (0.51 L/ac) tank-mixed with Roundup at 1.7 L product/ha (0.69 L/ac) plus 350 mL/ha (142 mL/ac) of a non-ionic surfactant.

Apply the above in 100 L of water/ha (40 L/ac). Cultivate 3 weeks after treatment. If application is made after September 1 or if soil moisture levels are extremely low subsequent to application crop injury may occur. Plant only cereal crops the year after treatment.

OR

Apply Amitrol-T at 22.0-35.0 L product/ha (8.9-14.2 L/ac) when the thistles are in the bud-bloom stage. Resume cultivation three weeks after treatment or follow-up with other chemical treatments as required.

OR

a) Work summerfallow or apply chemical fallow treatment as usual in the spring to control early germinating weeds and volunteer grain. Allow thistles to grow to the bud stage. Apply Roundup at 4.7-7.0 L product/ha (1.90-2.80 L/ac) in at least 100 L of water/ha (40 L/ac).

OR

b) For control of Canada thistle (rosette stage only) work summerfallow as usual with the last tillage operation during the last week of July. Allow thistles to regrow for a minimum of 4 weeks until they are a minimum of 15 cm (6 in.) in diameter and in the rosette stage of growth. Apply Roundup at 2.5 L product/ha (1.0 L/ac) in 50-100 L of clean water/ha (20-40 L/ac). Under dry conditions there may be insufficient regrowth to permit application. Use flat fan nozzles. Allow at least 10 days before resuming cultivation if desired. Do not use Roundup in galvanized spray equipment.

Quackgrass

Apply Amitrol-T at 22.0-35.0 L product/ha (8.9-14.2 L/ac) when quackgrass is growing rapidly and growth is 15 to 20 cm (6-8 in.) in height. Use at least 280 L of water/ha (110 L/ac). Plow or disc the treated area about 3 weeks after treatment when the quackgrass has turned white or purple. Spot treat any green re-growth. Repeat applications will be necessary where plowing or cultivation is not practiced.

OR

Work summerfallow or apply chemical fallow treatment as usual in the spring. Allow quackgrass to grow until just prior to heading. Apply Roundup at 4.7-7.0 L product/ha (1.90-2.80 L/ac) in at least 100 L of water/ha (40 L/ac). For quackgrass allow at least 7 days after treatment before resuming cultivation. Do not use Roundup in galvanized spray equipment.

Field Bindweed

Allow bindweed to grow to the flowering stage and then apply either one of the following treatments:

Apply Banvel LH (400 g/L) alone at 3.0 L product/ha (1.20 L/ac) or Banvel (480 g/L) alone at 2.5 L product/ha, or mixed with 2,4-D amine at 2.2 L product/ha (0.90 L/ac) in 100 L of water/ha (40 L/ac). Resume cultivation as required if re-growth occurs. Plant only cereal crops the following year and treat with 2,4-D or Banvel and 2,4-D mixtures as recommended for cereal crops.

OR

Apply Roundup at 7.0-12.0 L product/ha (2.8-4.9 L/ac) in 100 L of water/ha (40 L/ac). Plant to cereal crops the following year and treat with 2,4-D or Banvel and 2,4-D mixtures as recommended for cereal crops. Do not use Roundup in galvanized spray equipment.

2. Spot Treatment in Wheat, Oats, Barley, Seed Forages

Roundup may be used for spot treatment of quackgrass, Canada thistle, and other perennial weeds in wheat, oats, barley and seed forages. Treatment may be made up to heading of small grains and seed forages. Apply at recommended label rates and stage of weed growth. Applications can be made with a boom sprayer, hose and handgun or hand sprayer. **The Crop in the Treated Area Will Be Killed**. Take care to avoid drift outside the target area.

Volunteer Crop Control

Volunteer crops can be serious weed problems in seed fields and in continuous cropping programs. Since there are very few herbicides registered for controlling volunteer crops, control by herbicide alone is often not adequate. Therefore, control should be based on timely tillage supplemented, where possible, by herbicides. Choice of herbicides is limited and thus consideration must be given to choosing crop rotations which allow for use of an appropriate herbicide. At no time should a herbicide be used for volunteer crop control unless it is registered for use in the crop being grown.

The suggestions for volunteer crop control found in the chart at the centre of this booklet are based largely on field observations. In most cases the herbicides are not registered for this purpose and so any such use is entirely at the risk of the user.

Follow label recommendations regarding rates, stage of application, water volumes etc. that apply to the crop being produced. Most of these treatments will result in suppression rather than complete kill and satisfactory control will depend on competition from a vigorous crop. Use the highest rate that is safe for use in the crop produced.

Herbicide and Liquid Fertilizer Mixes

Some herbicides can be mixed with liquid fertilizers for once over application of both products. This practice should be used only for products which have been registered for this use. Thorough mixing and even application are required. Accurate calibration of application equipment is essential to ensure that the correct rate of herbicide is applied. Test the compatibility of the herbicide in the liquid fertilizer before adding the herbicide to the tank. Ensure that there is sufficient agitation to maintain uniform mixture in the tank at all times. There are compatibility agents available which produce a more uniform mixture. Check the herbicide label for specific names of agents and directions.

The following products can be applied with liquid fertilizer:

AATREX (Atrazine)
AVADEX BW (triallate)
EPTAM (EPTC)
ERADICANE (EPTC + R25788)
ESTEMINE MCPA
RIVAL EC (trifluralin)
RIVAL EC + AVADEX BW
SUTAN (alone or with AATREX)
TREFLAN (trifluralin)
TREFLAN + AVADEX BW
TRIFLUREX EC (trifluralin)
TRIFLUREX EC + AVADEX BW

NOTE: For specific directions regarding a herbicide and liquid fertilizer mix, refer to the product label.

Herbicide and Insecticide Mixes

Some herbicides can be mixed with insecticides for once over application. This practice should be used only for products which have been registered for this use and used on crops listed on both labels. Other mixtures may not be effective, may injure the crop, may leave a harmful residue in the treated crop or may endanger the health of the applicator. In many cases a specified time interval is required between the application of a herbicide and an insecticide.

Application of registered and recommended mixtures must be made at the proper stages for both weed and insect pests. The following herbicide and insecticide tank mixes are registered:

2,4-D (amine or ester) + Furadan Flowable
MCPA (amine or ester) + Furadan Flowable
Hoe-Grass + Decis
Hoe-Grass II + Decis
Stampede 360 + Decis

Note: For specific directions regarding a herbicide and insecticide mix, refer to the product label.

Soil Residual Herbicides

When applied at recommended rates in a crop, most herbicides disappear within a few weeks after application and impose no restriction on cropping options the next year. However, some herbicides do not disappear quickly and can persist in the soil for many months, or years following application, thereby restricting the crops that can be grown in rotation. Herbicides disappear from soils by various means. However, as a rule disappearance processes are favoured by mild and moist conditions. During winter when the ground is frozen, and the summer when the soil is dry, herbicide losses are minimal.

The residual activity of certain herbicides is also affected by soil organic matter and soil pH. These soil factors are seldom uniform across a field. Soils residual herbicide problems that are aggravated by low levels of organic matter are more likely to occur on eroded hilltops than in other parts of a field. Soil pH levels can vary significantly even within a field.

Growers should be aware of the residual properties before applying any herbicide if they are to avoid cropping restrictions in following years. A knowledge of the limitations associated with herbicides which leave a soil residue, along with an accurate record of application (i.e. rates, locations) will serve to minimize rotational problems.

Herbicides that leave a soil residue and are of particular concern in Saskatchewan are as follows:

2,4-D/MCPA - The major mode of disappearance of phenoxy herbicides is through biological degradation. When applied at recommended rates in a crop 2,4-D or MCPA disappear within a few weeks after application and impose no restriction on recropping options the next year. However 2,4-D or MCPA should not be applied in the spring either pre-emergence or prior to the seeding of a broad-leaved crop. Safe recropping intervals for broad-leaved crops cannot be given. The use of high rates of 2,4-D or MCPA in the fall as spot treatments to control Canada thistle can carryover and will affect sensitive broad-leaved crops sown early the following spring.

AVADEX BW (liquid and granular) - The major mode of disappearance of Avadex BW from the soil is through volatilization. Under normal conditions, Avadex BW will not leave a harmful residue in the soil to affect following crops. Under dry conditions, however, some Avadex BW may carryover. Therefore, oats should not be sown the year following application.

BANVEL - At recommended rates of application for use in cereal crops Banvel will not leave a harmful residue in the soil. However, high rates of application recommended for perennial weed control in summerfallow and in stubble after harvest may result in residue carryover that will damage the following crop. This is particularly true if application is made after September 1 or if soil moisture levels are extremely low following application. Plant only cereal crops the year after treatment.

FORTRESS - The major mode of disappearance of Fortress from the soil is through volatilization. This process is favoured by moist conditions. Under normal conditions, Fortress will not leave a harmful residue in the soil to affect following crops. However, under dry conditions some Fortress may carryover. Therefore, oats, small seeded forage grasses and canary seed should not be grown in rotation following a Fortress treated crop.

GLEAN - Soil moisture is important for the disappearance of Glean from treated soils, the greater the soil moisture the faster the disappearance. Soil pH also determines the rate of Glean disappearance from the soil. Several crops including canola, mustard, field peas, flax and lentils are extremely sensitive to Glean residues in the soil. As a result, the use of Glean is limited to continuous wheat or barley production, and to soils having a pH of less than 7.5. Residual effects may last 3 to 5 years depending upon rate applied and weather conditions. In the black soil zone canola or peas may be seeded the third season (34 mo.) following the last application of Glean where soil organic matter is greater than 5% and soil pH is 7.0 or less. This interval may be reduced if a successful field bioassy* has been completed.

LONTREL - Fields previously treated with Lontrel herbicide can be seeded to wheat, oats, barley, rye, flax, canola or summer fallowed. Do not seed to crops other than those listed the year after treatment. There are no cropping restrictions thereafter. For updated information concerning the seeding of specialty crops call 1-800-661-6436.

RIVAL trifluralin (liquid and granular) - The major mode of disappearance of trifluralin products from treated soils is by volatilization. This process is favoured by moist conditions. Dry conditions in the year during which a trifluralin treated crop is grown may result in residue levels that will carryover into the next season and injure wheat crops. To reduce the risk of wheat injury avoid deep seeding into cold ground. Barley is more tolerant to trifluralin

residues than wheat. Do not plant oats, fall rye, canary seed or small seeded grasses for 18 months after a spring application or 22 months after a fall application of trifluralin.

TORDON 202-C - The disappearance of Tordon 202-C from soils occurs slowly and varies according to location, climatic conditions and rate of application. Adequate moisture, warm temperatures and high organic matter content favour the degradation of Tordon 202-C, in addition, leaching also plays a role in the disappearance of Tordon 202-C residues.

Several broadleaf crops are very sensitive to Tordon 202-C residues in the soil. It is recommended that fields previously treated with Tordon 202-C herbicide should not be planted to alfalfa and sunflowers until at least the third growing season after the year of treatment; beans, lentils, peas and potatoes until at least the fifth growing season after the year of treatment. For updated information concerning the seeding of specialty crops call 1-800-661-6436.

TREFLAN trifluralin (liquid or granular) - See Rival.

TRIFLUREX trifluralin (liquid) - See Rival.

***Note:** A field bioassay means growing to maturity a test strip of the crop(s) intended for production the following year.

Aircraft Application

Aircraft applicators must exercise great care when applying herbicides if they wish (i) to get even distribution of the material, (ii) to avoid damage to nearby crops, and (iii) to avoid injury to the crop being treated. The following suggestions are offered to help minimize these hazards:

1. In order to get the best coverage of plants in the treated swath and to minimize the loss of spray material to the atmosphere.
   (1) Do not spray in winds over 15 km/h (9.3 mph).
   (2) Operate sprayer at 200 kPa (30 psi) except as specified.
   (3) For best results apply herbicides in volumes not less than 35 L/ha (15 L/ac).
   (4) Fly as low as feasible and safe.
   (5) Width of swath should not be more than 1.25 of wingspan (i.e. in most cases not more than 13.1 m (43 ft.)).
   (6) Space the nozzles on the boom to give uniform distribution in the swath in spite of swirl from propeller and vortexes at the wingtips.

2. To Avoid Drift Damage from Aircraft Application.
   (1) Do not spray when wind is blowing toward a sensitive crop, shelterbelt or garden. Safe distances cannot be given.
   (2) Do not spray in dead calm near sensitive plants. The "cloud" of suspended droplets may drift onto sensitive plants when the wind comes up.
   (3) Amines are less volatile than "low volatile" esters and should be used in preference to the low volatile esters.

3. To Avoid Injury to Crops.
   (1) Use water as a carrier in preference to oil. Injury is more likely to occur with oil than with water.
   (2) In order to minimize delay in maturity of flax, volumes of 50 L or more/ha (20 L/ac) should be used.
   (3) Apply at "safe" stage of growth of the crop.
   (4) Select the best chemical for the crop and weeds that are present and use only enough material for the degree of control desired.

Aircraft Application Chart

The following products are registered to be applied by aircraft to the crops indicated. Refer to the section on each product for rates of safe application.

	Barley	Oats	Rye	Wheat	Flax	Canola	Must.	Sflrs.	Peas
2,4-D amine	X		X	X					
MCPA amine	X	X	X	X	X				
Avadex BW Granular	X			X	X	X	X		
Avenge 200-C	X			X[1]					
Reglone (Crop Desiccation)					X	X	X	X	X
Dyvel	X	X		X					
Hoe-Grass	X		X	X	X	X	X		
Mataven				X[2]				X	
Poast					X	X			
Sabre/Bromox 720 M	X	X		X					
Buctril-M	X	X		X					
Banvel	X	X	X[3]	X					
Banvel + 2,4-D amine	X		X[3]	X					
Banvel + MCPA amine or K	X	X		X					

1. Glenlea, Neepawa, Chester, Macoun, Selkirk, Canuck, Benito, Columbus, Leader, Katepwa, HY320
2. Do not use on Selkirk wheat.
3. Spring rye only.

Crop Desiccation

The use of chemicals to desiccate crop foliage and weed growth can reduce the time from maturity to harvest and reduce harvesting difficulties in many crops. Desiccation does not, however, speed up the maturity of a crop. Treatments should not be applied until the crops have reached maturity. In cases of adverse weather conditions such as heavy rain, hail or strong wind, the resultant crop damage may be enhanced, taking into account that certain crops are more fragile than others.

Flax-Mustard-Canola

In light stands or fields free from weeds, apply Reglone (diquat) at 2.0 L product/ha (0.81 L/ac). In heavy stands or fields which contain weeds, use 2.75 L product/ha (1.11 L/ac). Use at least 45 L of water/ha (18 L/ac). Add Agral 90 at a rate of 0.1% of the total spray mixtures. Apply by means of a fixed wing aircraft fitted to apply uniform spray coverage.

Flax

Spray when the crop is at the 75% boll turn stage (normal swathing time). Do not apply when the crop is immature. Combine when the flax seed tests dry. Germination of seed is not affected by this treatment.

Mustard

Spray when the crop is at the 55-75% seed turn (green to brown) stage. Do not apply when the crop is immature or past the recommended stage of maturity. Pod and stem kill takes place in 7-10 days after application and eliminates the need to swath. Dessication also allows the delaying of swathing until just before combining, thus reducing the risk of losses due to blowing swaths. Commence combining no later than 14 days after treatment. Germination of seed is not affected by this treatment.

Canola (Polish type only)

Spray when the crop is at the 60-75% seed turn (green to brown) stage. Do not treat when the crop is immature of past the recommended stage of maturity. Commence combining no later than 14 days after treatment. Germination of seed is not affected by this treatment.

Sunflowers (Oil and Confectionery)

Apply Reglone at 1.5 L product/ha (0.61 L/ac) in 45 L of water/ha (18 L/ac) by means of a fixed wing aircraft fitted to apply uniform spray coverage. Spray when the seeds reach maturity (20-50% moisture in the seed and hull). Add Agral 90 at a rate of 0.1% of the total spray mixture. Germination of the seed is not affected by this treatment. Do not apply when the crop is immature or past the recommended stage of maturity. Commence combining 15-20 days after spraying.

Peas

Apply Reglone at 2.0 L product/ha (0.81 L/ac) in at least 45 L of water/ha (18 L/ac). In heavy stands or fields which contain weeds apply Reglone at 2.75 L product/ha (1.11 L/ac) in at least 45 L of water/ha (18 L/ac). Apply by means of a fixed wing aircraft fitted to apply uniform spray coverage. Spray when the crop has reached maturity. This treatment does not mature peas. Add Agral 90 at a rate of 0.1% of the total spray volume. Germination of seed is not affected by this treatment. Commence combining when the peas test dry.

Special Weed Problems

The following weeds have been identified as being difficult to control with limited chemical control information available. The herbicide treatments recommended may not be registered for control of the weeds listed. However, limited research data and field experience has shown that the following recommendations will usually give adequate control to the weeds listed. Registered treatments are marked with an asterisk (*).

Many of the recommendations are for spot treatment only on non-cropland. For those recommendations that may be used on field crops the herbicide must be applied only to those crops for which it is registered. **CAUTION:** Always follow registered use patterns in regard to application, timing and use precautions. Refer to product labels or product descriptions for application details. The use of any of the following recommendations on a non-registered crop or target area is entirely at the risk of the user.

Absinth

Banvel Herbicide: Apply at 2.5 L product/ha (1.0 L/ac) alone or at 1.25 L product/ha (0.51 L/ac) tank-mixed with 2,4-D amine at 2.2 L product/ha (0.90 L/ac) when plants are 10-20 cm (4-8 in.) tall (summerfallow, stubble, pastures, rangeland and non-cropland).

Roundup*: Apply 7.0-12.0 L product/ha (2.8-4.9 L/ac) at the early bud stage of growth. Allow seven days before resuming tillage (summerfallow, stubble and non-cropland).

2,4-D LV ester (600 g/L formulation): Apply 2.8 L product/ha (1.13 L/ac) in the spring and the fall when the weed is growing (summerfallow, stubble, pastures, rangeland and non- cropland).

Baby's-Breath

Banvel Herbicide: Apply 5.0 L product/ha (2.0 L/acre) when actively growing (pastures, rangeland and non-cropland).

Black Medick

Apply the following products at recommended rates:
Target, Estaprop, Buctril-M, Sabre, Bromox 720M, Mecoturf, and 2,4-D[1] at 1.1 L product/ha (0.45 L/ac) when black medick is in the 1-4 leaf stage (use on registered crops only).

Curled Dock

Banvel Herbicide*: Apply 2.1-2.5 L product/ha (0.85-1.0 L/ac) in 100-200 L of water/ha (40-80 L/ac) when dock is actively growing (summerfallow, stubble, pastures, rangeland and non-cropland). Use the high rate on summerfallow and stubble.

Roundup*: Apply 7.0-12.0 L product/ha (2.8-4.86 L/ac) in 100 L of water/ha (40 L/ac) at the early bud stage of growth. Allow seven days before resuming tillage (summerfallow, stubble and non-cropland).

For treatments that will provide topgrowth control in a crop refer to Herbicide Recommendation Chart.

Downy Brome

Roundup: Apply at 1.0 L product/ha (0.4 L/ac) with 350 mL/ha (140 mL/ac) of non-ionic surfactant in 50-100 L of clean water/ha (20-40 L/ac) before downy brome is 15 cm (6 in.) tall (summerfallow and stubble).

Foxtail Barley

Roundup: Application at 5.9 L product/ha (2.4 L/ac) in 300 L/ha of water (120 L/ac) as a post-emergence application in summer will provide a degree of control. Adequate spray coverage on vegetative parts of plants is important for control (summerfallow, stubble and non-cropland).

Kerb 50W*: Apply at 0.9 kg product/ha (0.36 kg/ac) on brown, dark brown or grey-wooded soils or 1.1 kg product/ha (0.45 kg/ac) on thin black or black soils to control established foxtail barley. Fall surface apply in 220 L of water/ha (90 L/ac). Apply only to established pasture stands seeded at least 2 years prior to application. Established stands of orchardgrass, Russian wild ryegrass, Altai wild ryegrass, bromegrass and meadow bromegrass will tolerate 1.1 kg product/ha. The yields of established stands of intermediate wheatgrass, tall wheatgrass, crested wheatgrass, Kentucky bluegrass and meadow fescue could be reduced 5 to 20% in the spring following a fall Kerb application of 1.1 kg product/ha. Kerb should not be applied on timothy.

Note: Tillage will provide the most effective control.

Knawel

Apply Bromox 720 M, Buctril-M, Hoe-Grass II*, Pardner, Sabre or Torch DS* at recommended rates to registered crops only.

Narrow-Leaved Hawk's-Beard

2,4-DB: Apply Embutox 625 at 2.25 L product/ha (0.91 L/ac), or Cobutox or2,4D Butyric 400 at 3.5 L product/ha (1.4 L/ac) in 150-200 L of water/ha (60-80 L/ac) after alfalfa has stopped growing in the fall.

2,4-D LV Ester 500: Apply 1.1-2.2 L product/ha (0.45-0.90 L/ac) to rosette in fall (summerfallow and stubble).

Pineappleweed

Apply 2,4-D[1] or MCPA[1] at 1.7 L product/ha (0.69 L/ac) to registered crops only. This rate may cause some crop injury.

Plantain

2,4-D/MCPA: For top growth control apply 2,4-D[1] at 0.84-1.1 L product/ha (0.34-0.45 L/ac) or MCPA[1] at 0.70-1.10 L product/ha (0.28-0.45 L/ac) to registered crops only.

2,4-DB*: For top growth control apply Embutox 625 at 2.25-2.75 L product/ha (0.91-1.11 L/ac) or, 2,4D Butyric or Cobutox at 3.5-4.25 L product/ha (1.40-1.72 L/ac) to registered crops only.

Tropotox Plus* For top growth control apply 4.25 L product/ha (1.70 L/ac) to registered crops only.

Poverty Weed

Banvel Herbicide*: Apply 4.6 L product/ha (1.86 L/ac) to actively growing plants (pastures, rangeland and non-cropland).

2,4-DB: Apply Embutox 625 at 2.25 L product/ha (0.91 L/ac) or Cobutox or 2,4D Butyric 400 at 3.5 L product/ha (1.40 L/ac). Apply on barley, oats and wheat, when the shoots of the weeds are 2.5 to 7.5 cm (1-3 in.) high. This may cause some crop injury, particularly to oats. In a two year rotation of cereal and summerfallow, apply to the weeds in the crop. Commence tillage immediately after harvest and continue wherever regrowth occurs throughout the summerfallow year. Repeat the rotation.

2,4-D LV Ester 500: Apply 4.4 L product/ha (1.80 L/ac) to gradually reduce the stand of poverty weed. Spot treatments for at least five years may be required to reduce the stand to a point of eradication (pastures, rangeland and non-cropland).

Quack Grass

For control recommendations refer to Fall Weed Control, Zero-Tillage Spring Treatment and Perennial Weed Control Sections. For top growth control in crop refer to Herbicide Recommendation Chart.

Round-Leaved Mallow

Estaprop*: Apply 1.75 L product/ha (.71 L/ac) at the 2-4 leaf stage of the weed.

2,4-D LV Ester 500: Apply 1.7 L product/ha (0.69 L/ac) in 100 L/ha water (40 L/ac) at the 2-4 leaf stage.

Kilmor*: Apply 1.1 L product/ha (0.45 L/ac) for suppression.

Bromox 720 M, Buctril-M, Sabre: Apply 0.78 L product/ha (0.32 L/ac) of Bromox 720 M or Sabre, or 1.0 L product/ha (0.40 L/ac) Buctril-M.

The above treatments should be applied to registered crops only in no less than 100 L of water/ha (40 L/ac) and at the 2-4 leaf stage of the round-leaved mallow.

Stork's-Bill

Estaprop*: Apply 1.75 L product/ha (0.71 L/ac) when weeds are at the 2-4 leaf stage to registered crops only.

2,4-D[1]/MCPA[1]: Apply at 1.4-1.7 L product/ha (0.56-0.69 L/ac) to the seedling stage in 100-165 L of water/ha (40-65 L/ac) to registered crops only. These high rates may cause some crop injury.

Afolan*/Lorox: Apply Afolan F or Lorox L at recommended rates tank-mixed with MCPA amine at 1.1 L product/ha (0.45 L/ac) at the 1-4 leaf stage to registered crops only.

Tansy

Roundup: Apply at 4.7-7.0 L product/ha (1.9-2.8 L/ac) in 100 L of water/ha (40 L/ac) to actively growing plants that are 20-25 cm (8-10-in.) tall (summerfallow, stubble and non- cropland).

Thyme-Leaved Spurge

2,4-D[1]/MCPA[1]: Apply at 0.56-0.84 L product/ha (0.23-0.34 L/ac). Formulated or tank mixtures of the above phenoxy herbicides with dicamba, bromoxynil or dichlorprop will give similarly good control. Apply to registered crops only.

Vetch (Vicia spp.)

2,4-D[1]/MCPA[1]: Apply at 1.1-1.7 L product/ha (0.45-0.69 L/ac) to registered crops only. The high rate of application may cause some crop injury.

Banvel Herbicide: Apply at 220-290 mL product/ha (93-117 mL/ac) with 2,4-D amine or MCPA amine at 850 mL product/ha (344 mL/ac) to registered crops only.

Volunteer Alfalfa

2,4-D[1]: Apply 1.25-1.70 L product/ha (0.51-0.69 L/ac) for top growth control to registered crops only. The high rate of application may cause some crop injury. Lontrel and and Glean (at 30 g product/ha) will provide control when applied to registered crops.

Water Smartweed

Amitrol-T: Apply 11.0-22.0 L product/ha (8.9-14.2 L/ac) in 500 L/ha water (200 L/ac). Use the higher rate during periods of cool or dry weather (summerfallow, stubble and non- cropland).

Banvel Herbicide: Apply 2.5 L product/ha (1.0 L/ac) in 550 L/ha water (220 L/ac) (summerfallow, stubble and non-cropland).

NOTE: Eradication with herbicides is impractical.

White Cockle

Mecoturf: Apply 5.5 L product/ha (2.23 L/ac) in 200 L/ha water (80 L/ac) for top growth control of established plants. Will also control seedlings. Apply to registered crops only.

Banvel Herbicide: Apply 290 mL product/ha (117 mL/ac) tank-mixed with 0.85 L product/ha (0.34 L/ac) of 2,4-D or MCPA amine, or 1.1 L product/ha (0.45 L/ac) of MCPA potassium salt to control seedlings in the 2-4 leaf stage. Apply to registered crops only.

2,4-DB: Apply Embutox 625 at 2.75 L product/ha (1.11 L/ac) or, 2,4D Butyric 400 or Cobutox at 4.25 L/ha (1.72 L/ac) for top growth control to registered crops only.

Wild Rose:

Refer to Herbicides for Rangeland and Native Pastures.

Wild Tomato:

2,4-D[1]/MCPA[1]: Apply at 0.84-1.1 L product/ha (0.34-0.45 L/ac) up to the 8-leaf stage. Formulated or tank mixtures of the above phenoxy herbicides with dicamba or bromoxynil will give similarly good control. Apply to registered crops only.

[1]These rates are for the amine formulations of 2,4-D and MCPA (500 g active ingredient/litre). For rates of other formulations of 2,4-D and MCPA see conversion factors on page 73.

Cleaning the Sprayer

The sprayer should be cleaned at the end of each day of use or before switching to other herbicides by flushing the tank, pump, hoses thoroughly with clean water. Clean the filters, screens and nozzles. Drain the tank and allow it to dry. Before spraying any crop that is sensitive to the herbicide previously used in the sprayer, it is recommended to repeat the above procedure at least once. Some products have specific cleaning recommendations (e.g. Glean). Refer to product labels for additional instructions. To clean the sprayer for winter storage the following procedures should be followed. To remove emulsion formulations (e.g. 2,4-D ester) proceed as follows:

a. Run clean water through the pump, tank, etc.
b. Remove and clean nozzles and screens.
c. Spray out through pump lines and drain thoroughly.
d. Half fill the spray tank with water.
e. Add household detergent (1 kg/250 L of water) and circulate for 5 to 10 minutes.
f. Wash down the inside of the tank with a mop or scrub brush. Do not enter the tank.
g. Spray out through pump lines and drain thoroughly.
h. Proceed to step d. below.

To remove water soluble (e.g. MCPA amine) formulations proceed as follows:
a. After draining sprayer thoroughly, fill with clean water and circulate through pump, lines, etc.
b. Drain the sprayer.
c. Remove nozzles and screens and wash separately.
d. Fill with clean water containing 1 L of household ammonia per 100 L of water.
e. Circulate this solution through entire sprayer system.
f. Wash down the inside of the tank with a mop or scrub brush. Do not enter the tank.
g. Allow to stand overnight.
h. Re-circulate cleaning solution for 5 to 10 minutes.
i. Drain entire sprayer system.
j. Rinse with clean water.

Never clean a sprayer near susceptible plants or where wash water could contaminate farm ponds, streams, or other supplies of water.

Effect of Rainfall on Herbicide Efficacy

*Interval Required	Product
30 minutes	Buctril-M, Pardner, Sabre, Torch DS, Bromox 720 M
1 hour	Embutox 625, Hoe-Grass, Hoe Grass II, Stampede 360, Stampede CM, TCA, 2,4-D Butryic 400, Poast, Afolan F, Lorox L, Cobutox
2 hours	Mataven,Mataven L, MCPA Ester, 2,4-D LV Ester, Bladex TTC
3 hours	Target, MCPA Estemine, 2,4-D Estemine
4 hours	Banvel, Blagal, Basfapon, Dowpon M, Tropotox Plus, 2,4-D Amine, Benazolin, Kilmor, Dyvel, MCPA Amine
6 hours	Avenge, Lexone DF, MCPA K, MCPA Sodium Salt, Roundup, Sencor 75DF, Sencor 500, Tordon 202C, Lontrel
8 hours	Asulox F, Amitrol-T, Basagran

*Time generally required between application and rainfall to avoid significant reduction in efficacy. Rainfall shortly after application of a post-emergence herbicide may reduce weed control. Effect will vary with the product, the interval between spraying and rainfall, and the amount and duration of rainfall. These guidelines are based on label information. Use the longest time interval when considering tank mixes.

Grazing and Feeding Restrictions

Product	Restriction
Afolan F	Do not graze or feed green plants to livestock.
Amitrol T	Do not graze until six months following treatment.
Asulox F	Do not graze or feed treated crops.
Avadex BW	No grazing restrictions except for underseeded legumes. Do not harvest legumes for forage in the year of seeding.
Avenge 200-C, 640 SP	Do not graze or feed underseeded forage crops during the year of establishment, or other crops for 8 weeks after treatment.
Banvel 10G	Do not graze or harvest for dairy feed (green or dry) for 60 days after treatment. There is no waiting period between treatment and grazing for meat animals, however, do not slaughter meat animals fed with treated forage or grazed on treated areas for 60 days after treatment.
Banvel LH, Banvel Herbicide	Do not graze or harvest cereal crops for livestock feed prior to crop maturity. Forage or grazed on treated areas within 30 days after the herbicide application. If treated vegetation has been consumed by meat animals within 30 days of application, feed the animal with untreated diet for 30 days before slaughter. For specific restrictions regarding dairy cattle refer to product label.
Basagran	None.
Basfapon, Dowpon M	Do not feed treated crop residues to livestock as residues may appear in meat and milk.
Blagal	Do not graze or feed the immature crop from the treated area to livestock.
Bromox 720 M	None.
Buctril M	None.
Dyvel	Do not graze or harvest for livestock feed prior to crop maturity.
Embutox 625, 2,4D Butyric 400, Cobutox	None.
Eptam 8E	None.
Estaprop	There is no information available on grazing restrictions.
Fortress	None.
Glean	None.
Heritage	None.
Hoe-Grass	Do not graze prior to harvest. Forages - do not graze or harvest in treatment year.
Hoe-Grass II	Do not graze treated crop prior to harvest.
Kerb 50W	Do not harvest or graze within 90 days after application of 3.25 kg/ha or 60 days after rates less than 3.25 kg/h.

Kilmor	Do not graze or harvest for feed prior to crop maturity.
Lexone DF	Do not graze or feed treated cereal crops to livestock within 30 days of application. Do not harvest for grain within 60 days of application. For peas, do not harvest or feed within 70 days of application.
Lorox L	Do not graze or feed green plants to livestock.
MCPA	Do not graze dairy cattle within 7 days of spraying.
Mataven, Mataven L	Do not graze treated areas. Forages - do not graze or harvest for feed in treatment year.
Mecoturf	Do not feed treated crop to livestock.
Pardner	None.
Poast	Do not graze treated fields or harvest for feed prior to crop maturity.
Princep Nine-T	Do not graze for 30 days or harvest for feed for 60 days after application.
Reglone	No waiting period after use before straw may be fed to livestock.
Rival	None.
Roundup	Do not graze or harvest treated areas until treated plants have turned brown and started to deteriorate.
Sabre	None.
Sencor 75DF, Sencor 500	Do not graze or feed treated crops to livestock within 30 days of application. Do not harvest for grain within 60 days of application. Do not feed, graze, or harvest peas or lentils within 70 days of application.
Simazine 80W	Do not graze for 30 days or harvest for feed for 60 days after application.
Stampede 360, Stampede CM	None
TCA, NaTA, Barfox DS	Do not graze treated areas for at least 24 hours after treatment.
Target	Do not graze or harvest for livestock feed prior to crop maturity.
Torch DS	Do not graze seedling grasses in the season in which they have been sprayed
Tordon 202-C	Do not allow animals to graze treated field within 2 weeks of treatment. Refer to label for precautions on use of of manure when treated crop is fed.
Treflan	None.
Triflurex	None.
Tropotox Plus	None.
2,4-D	Do not graze for 24 hours after treatment.

This is a summary of label restrictions for herbicides recommended for cereal and forage crops. Consult product labels for specific information and for other crops.

Winter Storage of Herbicides

Herbicides which are being carried over winter must be stored under correct conditions in order to avoid problems and losses the following year. Freezing causes some liquids to expand. This may result in broken containers and subsequent loss and contamination due to leaks. In addition, freezing may cause an irreversible separation or deactivation of ingredients which will render the product unusable or useless. All herbicides should be stored at temperatures above freezing.

However, some herbicides which separate on freezing can be brought back into suspension and thus made usable again by warming to room temperature (20-22 C) and agitating thoroughly on several successive days before use.

The following is a classification of the most commonly used herbicides according to their storage temperature requirements.

1. Herbicides which must be kept in heated storage. DO NOT FREEZE.

Afolan F
Amiben
Amines of 2,4-D, MCPA
AAtrex L
Alanap
Amitrol T
Asulox F
Avadex BW
Banvel LH
Basagran
Benazolin
Bladex L
Bladex TTC
Compitox
Cutrine
Dy-amine
Dycleer 24
Dyvel
Estemines (2,4-D, MCPA)
Gramaxone
Hoe-Grass
Hoe-Grass II
Hyvar XL
Killex
Kilmor
Lexone L
Lontrel
Lorox L
Mataven
Mataven L
MCPA K
MCPA Na
Mecoprop
Mecoturf
Mecoturf + 2,4-D
Premerge 360
Primatol Liquid
Randox
Reglone
Reglone A
Sinox
Sweep
TCA (liquid)
Torch DS
Tordon 22K
Tordon 101
Tordon 202-C
Tropotox
Tropotox Plus
Wypout 250

2. Herbicies which may be stored at freezing temperatures, but which must be returned to their original state by warming to room temperature (20-22 C), and agitating thoroughly on several successive days before use.

AAtrex Liquid
AAtrex Plus
Atrazine Liquid
Avenge 200-C
Banvel Herbicide
Blagal
Bromox 720 M
Buctril-M
Butryic 400
Carbyne 2EC
Cobutox
Dycleer
Dytop
Embutox 625
Eptam 8-E
Eradicane
Estaprop
Esters of 2,4-D, MCPA
Fusilade
Lasso
Pardner
Poast
Rival EC
Roundup
Sabre
Sencor 500
Silvaprop
Stampede 360
Stampede CM
Sutan +
Tillam
Treflan EC
Triflurex 40 EC

3. Herbicides normally sold as granules or powders: Not usually damaged by freezing. Store in dry place.

AAtrex WP
Amazine
Avadex BW 10G
Avenge 640 SP
Banvel 10G
Bar-Fox
Basfapon
Bladex 80 W
Bluestone
Calmix pellets
Dowpon M
Eptam 10G
Fortress
Glean
Heritage
Hyvar X
Karmex
Kerb 50W
Krovar
Lexone
Lorox WP
Primatol WP
Primatol G
Princep
Rival 10G
Sencor WP
Simazine 80W
Simmaprim
Sinbar
TCA NaTA
Tordon 10K
Treflan
Ureabor

Chemical Products and Availability

Product	Common Name	Activity	Manufacturer	Container Size	Available From (See List)
Aatrex	atrazine	480 g/L	Ciba-Geigy	2x10 L	3,10
Aatrex Nine-0	atrazine	90% WDG	Ciba-Geigy	5 x 4.5 kg	3,10
Aatrex Plus	atrazine + oil	400 g/L + oil	Ciba-Geigy	2 x 10 L	3,10
Afolan F	linuron	450 g/L	Hoechst	10 L	5,6,8,10
Amiben	chloramben	240 g/L	Union Carbide	20 L	5,10
Amitrol-T	amitrole	200 g/L	Union Carbide	1, 10 L	1,3,4,6,9
Asulox F	asulam	400 g/L	May & Baker	20 L	1,3,4,6,8,10
Atrazine 500	atrazine	500 g/L	Pfizer	10 L	5,10
Atrazine 5L	atrazine	500 g/L	IPCO	9 L	3
Attra Mix	atrazine + oil	400 g/L + oil	Chipman	20 L	1,4,6,8,9
Avadex BW	triallate	400 g/L,10% G	Monsanto	22.7 L, 22.7 kg	1,3,5,6,8,9
Avenge 200-C	difenzoquat	200 g/L	Cyanamid	20 L	1,3,4,5,6,8,9
Banvel LH	dicamba	400 g/L	Sandoz	10 L	1,3,4,6,8,9,10
Banvel Herbicide	dicamba	480 g/L	Sandoz	5 L 9.5 L	5 1,2,3,4,6,8,9,10
Banvel 10G	dicamba	10% G	Sandoz	11.3 kg	1,3,4,5,6,8,9
Bar-Fox DS	TCA	83% WSP	Ciba-Geigy	2 x 10 kg	10
Basagran	bentazon	480 g/L	BASF	4, 10 L	4,8,10
Basfapon	dalapon	74% WSP	BASF	2.25 kg	10
Benazolin	benazolin	330 g/L	Ciba-Geigy	5 L	3,8,10
Bladex TTC	cyanazine	480 g/L	Ciba-Geigy	2x10 L	3,6,8,9,10
Blagal	cyanazine + MCPA K (1:2)	375 g/L	Ciba-Geigy	2x10 L	3,6,8,9,10
Bromox 720 M	bromoxynil + MCPA	720 g/L	Union Carbide	6.25 L	5
Buctril M	bromoxynil + MCPA	560 g/L	May & Baker	2x8 L	1,3,4,6,8,10
*Carbyne 2EC	barban	240 g/L	United Agri	20 L	1,3,4,6,8,9,10,
Cobutox	2,4-DB	400 g/L	IPCO	4 L	3
Cytrol	amitrole	240 g/L	Cyanamid	20 L	2,5
Dalapon	dalapon	74% WSP	IPCO	25 kg	3
Dowpon M	dalapon	74% WSP	Dow	25 kg	3
Dynap	naptalam +	3.6 lbs./gal.	Uniroyal	1.5 gal.	manufacturer
Dyvel	dicamba + MCPAK	420 g/L	Velsicol	10 L	1,3,4,5,6,8,9,10
Embutox 625	2,4-DB	625 g/L	May & Baker	2 x 10 L	1,4,6,8,10
Eptam-8E	EPTC	798 g/L 10% granular	Chipman	20 L	1,6,8,9,10
Eradicane	EPTC + R25788	798 g/L	Chipman	20 L	1,6,8,9,10
Estaprop	Dichlorprop + 2,4-D	600 g/L	May & Baker	2x8 L	1,4,6,8,10
Estemine MCPA	MCPA amine	500 g/L	Ciba Geigy	2x10 L	3,6,8,10
Estemine 2,4-D	2,4-D amine	470 g/L	Ciba-Geigy	2x1 L	3,6,8,10
Fortress	triallate + trifluralin	14%	Monsanto	22.7 kg	1,8
Glean	chlorsulfuron	75% DF	Dupont	500 g	2,3,5,8,9
*Gramoxone	paraquat	200 g/L	Chipman	1.5 L	1,6,8,9,10
Heritage	trifluralin	5% G	Elanco	25 kg	1,3,6,8,10
Hoe-Grass	diclofop methyl	284 g/L	Hoechst	20 L	3,6,8,9
Hoe-Grass II	diclofop methyl + bromoxynil	310 g/L	Hoechst	20 L	3,6,8,9
Kerb 50W	propyzamide	50 WP	Rohm & Haas	2 kg	2,3,4,8
Kilmor	dicamba + mecoprop + 2,4-D	500 g/L	Ciba-Geigy	2x10 L	10
Lexone DF	metribuzin	75% DF	Dupont	2.5 kg	1,2,3,7,8
Lontrel	clopyralid	200 g/L	Dow	2x4 L	1,3,4,5,6 8,9,10
Lorox L	linuron	480 g/L	Dupont	10 L	1,2,4,7,8,9
Mataven, Mataven L	flamprop-methyl	84 g/L 52.5 g/L	Ciba-Geigy	2x10 L	3,6,8,9,10
MCPA	MCPA	300,400,500 g/L	various	various	various
Mecoturf	mecoprop	150 g/L	May & Baker	2x8 L	1,4,6,8,10
Monoborchlorate	sodium metaborate	97.8% G tetrahydrate + sodium chlorate	Occidental Chemicals Co.	50 lb.	7,10
NaTA	TCA	85% WSP	Hoechst	25 kg	3,5,6,8,9
Pardner	bromoxynil	280 g/L	May & Baker	2x8 L	1,4,6,8,10
Princep Nine T	simazine	90% WDG	Ciba-Geigy	12 x 1.5 kg	10
*Randox	allidichlor	480 g/L,20% G	Monsanto	18.9 L,22.7 kg	5
Reglone	diquat	200 g/L	Chipman	10 L	1,6,8,9,10
Rival	trifluralin	500 g/L,10% G	Hoechst	9 L, 22.7 kg	5,9,10
Roundup	glyphosate	356 g/L	Monsanto	1,4,10 L	1,3,5,6,8,9
Sabre	bromoxynil + MCPA	720 g/L	Union Carbide	12.5 L	1,3,4,6,8,9,10
SEE 2,4-D	2,4-D ester	500 g/L	Pfizer	10 L	5

*Warning - "Safety data and registration of these products are under review. Directions for use and cautionary statements should be carefully followed. Read the label before using."

Product	Common Name	Activity	Manufacturer	Container Size	Available From (See List)
Sencor	metribuzin	75% DF, 500 g/l	Chemagro	3 kg, 5 L	1,4,5,6,8,9
Simazine 80W	simazine	80% WP	Pfizer	2 kg	5
Sinbar	terbacil	80 WP	Dupont	2 kg	1,3,5,6,8,9
Stampede 360	propanil	360 g/L	Rohm & Haas	22.7 L	1,3,5,6, 8,9,10
Stampede CM	propanil + MCPA (7:2)	460 g/L	Rohm & Haas	22.7 L	1,3,5,6,8,9,10
Sutan +	butylate	798 g/L	Chipman	20 L	1,6,8,9,10
*Sweep	paraquat	250 g/L	Chipman	2x10 L	1,6,8,9,10
Target	dicamba + mecoprop + MCPA	400 g/L	Ciba-Geigy	2x10 L	3,6,8,9,10
TCA		85% WSP	IPCO	25 kg	3
Torch DS	bromoxynil	450 g/L	Union Carbide	10 L	1,3,4,5,6 8,9,10
Tordon 202C	picloram + 2,4-D	212 g/L	Dow	20 L	1,3,4,5,6,8,9,10
Treflan	trifluralin	545 g/L, 5% G	Elanco	8.5 L, 25 kg	1,3,6,8,10
Triflurex	trifluralin	400 g/L	Makhteshim	22.7 L	10
Tropotox Plus	MCPB + MCPA	400 g/L	May & Baker	2x8 L	1,2,4,6,8,10
2,4-D	2,4-D	400,500,600 700,800 g/L	various	various	various
2,4D Butyric 400	2,4-DB	400 g/L	Pfizer	10 L	5,10

1. Cargill Grain
2. Chipman Chemicals
3. Federated Co-operatives
4. Oliver
5. Pfizer
6. Pioneer Grain Co.
7. Saskatchewan Association of Rural Municipalities
8. Saskatchewan Wheat Pool
9. United Grain Growers
10. Independent Dealers

Abbreviations:

WP	wettable powder
WDG	water dispersible granule
EC	emulsifiable concentrate
G	granule
WSP	water soluble powder
DF	dry flowable

***Warning - "Safety data and registration of these products are under review. Directions for use and cautionary statements should be carefully followed. Read the label before using."**

Additional Information

Publications

For more information on herbicides and weed control, consult the following publications available from your Agricultural Representative.

1. Guide to Field Sprayer Operation - Saskatchewan Agriculture.
2. Weed Identification Series - Saskatchewan Agriculture.
3. Weed Control in Lawns - Saskatchewan Agriculture.
4. Shelterbelt Weed Control - PFRA.
5. Growth Habit and Control of Wild Oats - Agriculture Canada –1531. (Revised 1983).
6. Weed Seedling Identification - Saskatchewan Agriculture.
7. Guide to Farm Practice in Saskatchewan.
8. Weed Control Notes on Corn - Saskatchewan Agriculture.
9. University of Saskatchewan Production Guides in Flax, Lentils, Field Peas, Fababeans.
10. Pesticide Safety Handbook - Saskatchewan Agriculture.

Personnel

General Weed Control

Saskatchewan Agriculture
Weed Control Specialist
Regina - 787-4673
Soils & Crops Specialists
Saskatoon - 933-5285
North Battleford - 446-7646
Swift Current - 773-2866
Tisdale - 873-2693
Weyburn - 842-4607
Yorkton - 783-9743
Agriculture Representatives

Agriculture Canada

Regina Research Station - 585-0255
Melfort Research Staton - 752-2776
Scott Research Station - 247-2011
Swift Current Station - 773-4621

University of Saskatchewan - 966-5006

Chemical Company Technical Representatives

CACA Certified Dealers

Special Crops
Crop Development Centre (Saskatoon) - 966-4971
Indian Head Experimental Farm - 695-2274

Forage Crops

Swift Current Research Station - 773-4621
Melfort Research Station - 752-2776

Irrigation Crops
Saskatchewan Agriculture - Outlook - 867-8683

Shelterbelts
PFRA Tree Nursery Indian Head - 695-2284

Weed Control Equipment
University of Saskatchewan - 966-5301

Toxicology Centre
University of Saskatchewan - 966-7441

Spill Report
Saskatchewan Environment - 1-800-667-3503

Soil Testing Lab
University of Saskatchewan - 966-6890

All CACA Certified Dealers have successfully completed a Canadian Agricultural Chemical Association training program in the safe and proper use of agricultural pesticides. Look for this certificate when you purchase agricultural pesticides.

Major Poison Control Centres in Saskatchewan

Saskatoon - University Hospital - (306) 966-1010
Regina - Regina General Hospital - (306) 359-4545

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Saskatchewan
Agriculture

Hon. Grant Devine, Premier
Minister of Agriculture

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